LAKE CHAMPLAIN BASIN

HADLOCK POND DAM

WASHINGTON COUNTY
NEW YORK
INVENTORY NO. N.Y. 625

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

CONTRACT NO. DACW-51-79-C0001

NEW YORK DISTRICT CORPS OF ENGINEERS
JUNE, 1979

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

HADLOCK POND DAM
I.D. No. NY-625
(2238-1298-LC)
LAKE CHAMPLAIN BASIN
WASHINGTON COUNTY

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.
Hadlock Pond Dam did not reveal conditions which pose an immediate threat to life or property. Additional studies recommended. Possible embankment overtopping can result from storms exceeding 13% of PMF. Assuming complete breaching of embankment, water surface levels could reach depths posing significant danger to residents. Consequently spillway assessed as unsafe.

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non-emergency (SEE REPORT ASSESSMENT). A detailed emergency operation plan, warning system, and surveillance should be implemented as remedial measures are completed. Additional deficiencies noted.

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PHASE 1 REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Hadlock Pond Dam - I.D. No. NY 625
State Located:	New York
County:	Washington
Watershed:	Lake Champlain Basin
Stream:	Unnamed Tributary of Halfway Creek
Date of Inspection:	April 17, 1979

ASSESSMENT

Examination of available documents and a visual inspection of the dam did not reveal conditions which constitute an immediate hazard to human life or property. However, additional studies should be undertaken to further evaluate conditions affecting the dam.

Additional hydrologic investigations are required to more accurately determine the site specific characteristics of the watershed. Using the Corps of Engineer's Screening Criteria for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped for all storms exceeding 13% of the PMF (Probable Maximum Flood). A flood wave analysis, assuming a complete breaching of the embankment, indicates that water surface levels downstream of the dam could reach depths which would pose significant danger to residents. The spillway is, therefore, adjudged as seriously inadequate and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to loss of life downstream of the dam.

It is, therefore recommended that within 3 months of the date of notification of the owners, a hydrologic investigation of the structure should be undertaken to determine the appropriate mitigating measures to be taken. Within 18 months of the date of notification, appropriate remedial measures should be completed. In the interim, a detailed emergency operation plan and warning system should be developed and around-the-clock surveillance should be provided during periods of unusually heavy precipitation.

There are a number of additional deficiencies which should be corrected. A method of treatment to control or eliminate the seepage which was noted at the downstream toe should be devised. The depression along the crest of the embankment should be filled raising the crest to a uniform elevation of 100 (plan datum). All trees and brush growing on the embankment should be cut. The grouted riprap on the auxiliary spillway channel should be repaired. An attempt should be made to establish a grass cover on the reconstructed segment of the embankment. Finally, the leaning power pole should be repaired or replaced. These actions should be taken within 1 year of the date of notification of the owner.

George Koch
Chief, Dam Safety Section
New York State Department
of Environmental Conservation
NY License No. 45937

Approved By:

Col. Clark H. Benn
New York District Engineer

Date: 24 Sept 79

OVERVIEW
HADLOCK POND DAM
I.D. No. N.Y. 625
(Looking West)

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
Badlock Pond Dam
I.D. No. N.Y. 629
22381-1098
Lake Champlain Basin
Washington County, N.Y.

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority
The Phase I inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection
This inspection was conducted to evaluate the existing conditions of the dam, to identify deficiencies and hazardous conditions, to determine if these deficiencies constitute hazards to life and property, and to recommend remedial measures where required.

1.2 DESCRIPTION OF PROJECT

a. Description of the Dam
The Badlock Pond Dam is an earth and rock fill structure with a principal spillway pipe passing through the dam and a concrete emergency spillway channel crossing the crest of the embankment.

The embankment is 29 feet high and 850 feet long. The crest is 16 feet wide. The embankment slopes vary from a 1 on 2 to a 1 on 3 (vertical to horizontal) on the upstream face and from a 1 on 1 to a 1 on 2 on the downstream face. The dam was built in various stages resulting in a non-uniform cross section.

The original dam, built in 1896, was a stone filled timber crib structure with 2 by 10 inch plank sheeting on the upstream face. The dam was later expanded by the addition of earth and boulder fill on the upstream side and by the placement of stone fill on the downstream side. The cross section of most of the dam conforms to this description. One section of embankment, 135 feet in length and near the center of the dam, was reconstructed in 1977. The timber crib and rock fill was partially removed in this section and replaced with compacted sand and gravel. According to the plans for the reconstruction, a graded filter toe drain was included on this section.

The principal spillway consists of a rectangular precast concrete riser, a 48 inch diameter reinforced concrete pipe barrel with anti-seepage collars and a riprap lined plunge pool to dissipate energy at the outlet

end of the conduit. A reservoir drain consisting of a 30 inch diameter concrete pipe extends from the upstream toe of the embankment to the base of the principal spillway riser. A 30 inch diameter gate mounted inside of the riser controls the flow through the reservoir drain. The auxiliary spillway is a concrete channel 30 feet wide which passes through the embankment crest. A concrete cutoff wall extends approximately 7 feet below the upstream face of the spillway crest.

b. Location

The Hadlock Pond Dam is located on a tributary of Halfway Creek. The dam is off Hadlock Pond Road approximately 1/2 mile north of State Route 149 near the hamlet of West Fort Ann.

c. Size Classification

This dam is 29 feet high and the reservoir has a storage capacity of 2635 acre-feet. Therefore, the dam is in the intermediate size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The dam is classified as "high" hazard due to the presence of 11 residences, a town road, and the state highway downstream of the dam.

e. Ownership

The dam was originally owned by the Kanes Falls Electric Company of Glens Falls, New York. Since 1900, the ownership of the dam has changed a number of times. The dam is presently owned by the Town of Fort Ann. A park district with taxing powers was created within the Town in 1977 to finance the reconstruction of the dam. The Hadlock Lake Association is an organization composed of people who own property on the pond. This group is responsible for the maintenance of the dam.

The supervisor of the Town of Fort Ann is Harold Gould (518) 639-8860. The President of the Hadlock Lake Association is Steven Craig (518) 793-3969.

f. Purpose of Dam

The dam was originally constructed to provide a storage pool for power generation. The dam is now used to maintain the water surface of Hadlock Pond for recreational purposes.

g. Design and Construction History

No information was available concerning the original design of the dam. Records indicate that it was built in 1896 by the Kanes Falls Electric Company. The original dam consisted of a stone filled timber cribbing with a gravel embankment upstream of the cribs and rock fill downstream.

There have been a number of modifications and reconstructions. Additional fill was placed which covered and butressed the timber cribbing. A concrete auxiliary spillway channel was built in 1933 replacing the plank spillway channel. In 1975, one of two 30 inch diameter principal spillway pipes collapsed causing a large quantity of embankment material to wash through the pipe. The dam was subsequently breached in a controlled manner during May of 1976.

The dam was reconstructed in 1977 using plans and specifications prepared by Mr. Daniel Buckley, P.E. This reconstruction involved installing the concrete riser and the 48 inch diameter principal spillway pipe, replacing the embankment in the breached section, adding a concrete cutoff wall and grouting under the auxiliary spillway.

Copies of plans from the 1933 and 1977 reconstructions have been included in Appendix G.

h. Normal Operating Procedures

Normal flows are discharged through the principal spillway. Flows from the pond are not regulated.

1.3 PERTINENT DATA

a. Drainage Area (acres)	5628
b. Discharge at Dam (cfs)	
Principal Spillway at Max. High Water	312
Auxiliary Spillway at Max. High Water	832
Reservoir Drain at Spillway Crest Elevation	117
c. Elevation (plan datum)	
Top of Dam	99.9
Auxiliary Spillway Crest	96.21
Principal Spillway Crest	96.07
Invert of Reservoir Drain Inlet	75.1
Lake Surface Elevation - (USGS Datum)	454
(USGS - Putnam Mountain, NY Quad 1966)	

d. Reservoir	Surface Area (acres)
Top of Dam	265
Crest of Emergency Spillway	202
Crest of Principal Spillway	194

e. Storage Capacity	(acre-feet)
Top of Dam	2635
Auxiliary Spillway Crest	1704
Principal Spillway Crest	1604

f. Dam

Embankment Type: Timber cribbing filled with rocks covered with sand and gravel embankment material and buttressed with rock fill.

Embankment Length (ft.)		850
Slopes (V : H)	Upstream varies from	1 on 2 to 1 on 3
	Downstream varies from	1 on 1 to 1 on 2
Crest Elevation (Plan Datum)		99.9
Crest Width (ft.)		16

g. Principal Spillway (Service)

Type: Uncontrolled, precast concrete drop inlet (5 X 7 ft.) rising 23.5 feet, 48 inch reinforced concrete conduit 80 feet long; riprap lined plunge pool.

Length (ft.) Weir	24

h. Auxiliary Spillway

Type: Trapezoidal concrete lined channel having 30 inch sharp crested weir with one 4 inch by 4 inch stoplog across the crest; a concrete apron (20 by 28 feet) and grouted riprap on the downstream slope.

Bottom Width (ft.)	30
Side Slopes (V : H)	' on 1
Exit Slope:	0.59

i. Reservoir Drain

Type: 30 inch diameter concrete pipe
Control: Mechanically operated gage vertically mounted inside of the principal spillway riser.

SECTION 2. ENGINEERING DATA

2.1 DESIGN

a. Geology

The Hadlock Pond Dam is located in the Adirondack Mountain physiographic province of New York State. The bedrock in the area consists of old sedimentary rocks into which various igneous rock types have made intrusions. The original rock has been metamorphosed during the course of geologic time by heat, pressure, folding, and faulting. Dominant rock types include medesedimentary gneisses, marbles and quartzites. The surficial soils are the result of glaciations during the Cenozoic Era, the last of which was the Wisconsin glaciation.

b. Subsurface Investigations

The subsurface information available was limited to some general descriptions from old inspection reports and one boring which was progressed in 1977. The inspection reports indicate that the foundation material is predominantly compact silty sand. The one boring progressed in 1977 confirms this observation.

c. Embankment

No information was available concerning the design of the original timber crib and rock fill structure. A portion of the dam was reconstructed in 1977. The design for this reconstruction was performed by Mr. Daniel L. Buckley, P.E.

2.2 CONSTRUCTION RECORDS

No information was available concerning the construction of the original timber crib and rock fill structure. Plans were available from the auxiliary spillway reconstruction of 1933 and there were records in the files concerning the major reconstruction which was done in 1977 under the supervision of Mr. Daniel Buckley, P.E. At that time, the riser and barrel of the principal spillway were installed and a portion of the embankment was reconstructed.

The construction records available include the results of three compaction tests performed by Empire Soils Investigations, Inc., and a report from a field inspection made during construction by representatives of the New York State Department of Environmental Conservation and Department of Transportation (Soil Mechanics Bureau). The compaction tests indicate that an acceptable degree of compaction was attained. However, the three tests which were performed were all taken at the same elevation and were all within 25 feet of the riser. The field inspection report from the Department of Transportation (a copy of which has been included in Appendix E), indicated their concern with the construction procedures used for backfilling and compacting soil around the principal spillway pipe. In addition, DOT stated that the fill which was used was only marginally acceptable.

2.3 OPERATION RECORDS

There are no operating or water level records available for this structure.

2.4 EVALUATION OF DATA

The data presented in this report was obtained from the Department of Environmental Conservation files. Information concerning the original timber crib and rock fill structure and regarding subsurface conditions was rather limited. However, the information available appears to be adequate and reliable for Phase 1 inspection purposes.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of the Hadlock Pond Dam was conducted on April 17, 1979. The weather was overcast and the temperature was in the mid-forties. The water surface at the time of inspection was 2.2 feet below the crest of the principal spillway. The valve on the reservoir drain was open, maintaining the water surface at the winter level.

b. Embankment

Inspection of the embankment revealed a number of deficiencies. Evidence of seepage was observed at the downstream toe in the area between the outlet pipe of the principal spillway and the point where the auxiliary spillway passes through the embankment. The embankment in this area is composed of the original rock filled timber cribs which had been covered with fill material and rock. The effective slope of the embankment had been flattened by the addition of a rock berm at the downstream toe. Seepage was emerging from the base of the berm in two locations. The quantity of seepage in both cases was fairly small and there was no evidence of movement of fine soil particles.

There was a depression on the crest of the embankment in the vicinity of the principal spillway conduit. This depression is a gradual dip across the area which was reconstructed in 1977 and is probably the result of settlement of the new fill.

Trees and brush were growing on the slopes of the embankment on either end of the dam. In the center section, which was reconstructed in 1977, there was no vegetation. The crest and slopes in this area were covered by cobbles and boulders. The final deficiency observed was a leaning power pole located on the embankment crest.

c. Principal Spillway

The principal spillway pipe, the riser and the plunge pool all appeared to be in satisfactory condition. Inspection of the pipe did not reveal any joint separations or deviations from proper alignment. There was minor leakage coming through the joints of the precast concrete sections which form the riser. A steel I beam had been attached to the top of the riser, raising the principal spillway crest elevation some 10 inches.

d. Auxiliary Spillway

The auxiliary spillway is a concrete channel through the embankment. A 4 inch by 4 inch timber had been bolted to the concrete to raise the spillway crest.

There were a number of large cracks, most of which had been patched, on the spillway walls and apron. The largest crack was at the first joint on the apron where the slope of the channel increases. The lower apron slab on the western end of the channel was approximately a foot lower than the upper slab. The side wall in this area had separated to

such an extent that two sets of angle iron straps joined by bolts were being used to hold the end section in place. To fill voids under the concrete apron and to treat the serious cracks, a grouting program was performed in 1977 as part of the reconstruction. The area under the apron slab was the primary section treated but some of the grout penetrated under the riprap. The grouting program successfully treated most of the cracks and there is no longer any evidence of voids beneath the slab.

The grouted riprap extends down the slope beyond the end of the concrete apron. The upper portion was in satisfactory condition but the lower segment was cracked and uneven due to the voids beneath the stone. There were logs and other debris caught in this section of the spillway. The extent of the grout penetration beneath the riprap could be observed by looking into voids which exist under this downstream portion of the channel.

There was also a void behind the west wall of the channel. The fill near the wall had sloughed, leaving the wall partially unsupported. The problem is most serious in the vicinity of the angle iron straps and as a result, one of the straps is failing.

e. Reservoir Drain

The valve for the reservoir drain was operated at the time of inspection. While it was not possible to achieve a complete seal on the valve, the operation of the drain was satisfactory.

f. Downstream Channel

The outlet channel was in satisfactory condition with no severe side slope erosion or debris obstructions in evidence. The area below the dam was primarily wetlands. The tailwater at the time of the inspection was approximately 1 foot above the invert of the principal spillway outlet.

g. Reservoir

There were no signs of soil instability in the reservoir area.

3.2 EVALUATION OF OBSERVATIONS

Visual observations revealed a number of deficiencies on this structure. The following items were noted:

1. A small quantity of seepage coming through the embankment.
2. A depression due to settlement of new fill in the area of the reconstruction.
3. Trees and brush growing on the embankment.
4. No grass to prevent erosion on the reconstructed embankment section.
5. Voids beneath and the generally poor condition of the grouted riprap at the end of the auxiliary spillway.
6. A void beneath the western side wall of the auxiliary spillway.
7. A leaning power pole on the crest of the dam.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal water surface elevation is at the principal spillway crest elevation. The reservoir drain valve is opened in the fall and the water surface is lowered for the winter. The valve is then closed in late April, after the ice has melted from the pond, and the water surface is allowed to return to the normal level.

The reservoir provides 1031 acre-feet of storage between the crest of the principal spillway and the top of the dam.

4.2 MAINTENANCE OF DAM

The dam is maintained by the Hadlock Lake Association. Very little maintenance has been done in the past. Trees and brush growing on the embankment and voids under the grouted riprap of the auxiliary spillway channel are examples of deficiencies which exist on this structure.

4.3 WARNING SYSTEM IN EFFECT

No apparent warning system is present.

4.4 EVALUATION

A comprehensive maintenance program for the dam is required. This program should include items such as removal of the brush and trees and attempting to develop a growth of grass which can be mowed on the slopes and crest of the dam.

SECTION 5: HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

Delineation of the watershed draining into the reservoir pool area was made using the USGS 7.5 minute quadrangle for Putnam Mountain, N.Y. The 8.79 square mile drainage area consists of forested and wooded lands. Relief in the drainage area is relatively steep with slopes ranging from 8 to 40%. Mountain peaks occur at elevations 500 to 1700 feet above the normal lake level.

5.2 ANALYSIS CRITERIA

The analysis of the floodwater retarding capability of this dam was performed using the Corps of Engineers HEC-1 (Dam Break version) computer program, incorporating the "Snyder Synthetic Unit Hydrograph" method and the "Modified Puls" flood routing procedure. The spillway design flood selected for analysis was the PMF in accordance with recommended guidelines of the U.S. Army Corps of Engineers.

5.3 SPILLWAY CAPACITY

The principal and auxiliary spillways are uncontrolled structures. The principal spillway operates under weir or orifice flow conditions depending on the inflow to the reservoir pool. During orifice flow operation, pressure flow develops in the 48 inch conduit. The auxiliary spillway was analyzed as a sharp-crested weir having a discharge coefficient (C) of 3.32.

Both spillways have been modified since the latest reconstruction in 1977. A steel I beam was added to the riser increasing the principal spillway crest elevation by 10 inches. A 4 X 4 inch timber was attached to the concrete of the auxiliary spillway raising the crest of this spillway as well.

The spillways do not have sufficient capacity for discharging the peak outflow from either the PMF or 1/2 the PMF. For the PMF, the peak inflow is 9439 cfs and the peak outflow is 8950 cfs. For 1/2 the PMF, the peak inflow is 4720 cfs and the peak outflow is 4000 cfs.

5.4 RESERVOIR CAPACITY

Normal storage capacity of the reservoir between the principal and auxiliary spillways is 100 acre-feet which is equivalent to a runoff depth of 0.21 inches over the drainage area. Surcharge storage capacity to the top of the dam is an additional 931 acre-feet, which is equivalent to a runoff depth over the drainage area of 1.98 inches. Total storage capacity of the dam is 2635 acre-feet.

5.5 FLOODS OF RECORD

No information was available regarding the occurrence of the maximum known flood.

5.6 OVERTOPPING POTENTIAL

Analysis using the PMF and 1/2 the PMF indicates that the dam does not have sufficient spillway capacity. For a PMF peak outflow of 8950 cfs, the spillway capacity of 1143 cfs is only 13%. Hence, the embankment would be overtopped to a computed depth of 2.43 feet for this outflow.

For the peak outflow from 1/2 the PMF, the embankment would be overtopped to a computed depth of 1.21 feet.

5.7 EVALUATION

Using the Corps of Engineer's screening criteria for initial review of spillway adequacy, it has been determined that the embankment would be overtopped by all storms exceeding 13% of the PMF. A flood wave analysis, assuming complete breaching of the dam, indicates that water surface levels downstream of the dam could reach depths which pose a significant danger to residents.

The spillway capacity is, therefore, adjudged to be seriously inadequate and the dam is assessed as unsafe, non-emergency.

SECTION 6: STRUCTURAL STABILTIY

6.1 EVALUATION OF STRUCTURAL STABILTIY

a. Visual Observations

Visual observation of the embankment did not reveal any signs of major distress. The vertical alignment was slightly irregular with a depression in the area of the principal spillway conduit. Seepage was observed in two locations along the downstream toe. The locations and magnitude of this seepage was discussed in Section 3.

There were voids observed beneath the grouted riprap of the auxiliary spillway on the downstream slope. The voids were down the slope from the area which was grouted as part of the 1977 reconstruction. In addition, the end section of the western side wall on the auxiliary spillway had separated from the main wall. Angle irons connected by threaded rods were bolted to the concrete in an attempt to hold the sections together.

b. Design and Construction Data

No design data was available concerning either the original construction or any of the reconstructions. Construction plans were available for the 1933 modifications to the auxiliary spillway, and for the 1977 major reconstruction.

c. Post-Construction Changes

Major modifications were made to this structure in 1933 and 1977. These changes, which involved reconstruction of both the principal and auxiliary spillways, have been discussed in other sections of the report. Copies of construction plans for these changes have been included in Appendix G.

A change which has been made since the 1977 reconstruction has been the addition of a 10 inch steel I beam to the crest of the principal spillway and a 4 x 4 inch timber to the crest of the auxiliary spillway.

d. Seismic Stability

The dam is located in Seismic Zone 2. Since there was not sufficient data available to select parameters for the embankment materials, it was not possible to perform a seismic stability analysis. The dam did, however, appear to be stable.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

The Phase 1 inspection for the Hadlock Pond Dam revealed that the spillway is seriously inadequate and outflows from either the PMF or 1/2 the PMF would overtop the dam. This overtopping could cause breaching of the dam and the resulting floodwave would significantly increase the hazard to downstream residents. For this reason, the dam has been assessed as unsafe, non-emergency.

There are several other deficiencies on this structure, such as the seepage noted and the generally poor condition of the grouted riprap on the auxiliary spillway. These deficiencies could present a hazard if allowed to deteriorate further.

b. Adequacy of Information

There was some information available for the preparation of this report. The information was adequate with the exception of a lack of subsurface information and the lack of as-built plans showing actual elevations of the embankment crest, the service spillway crest and the auxiliary spillway crest.

c. Need for Additional Investigations

Since the spillway was rated as seriously inadequate, additional hydrologic/hydraulic investigations are required to more accurately determine the site specific characteristics of the watershed.

An engineering investigation and analysis will be required to design a method of treatment to eliminate or control the seepage at the downstream toe of the embankment.

d. Urgency

The additional hydrologic/hydraulic investigations which are needed should be commenced within 3 months of the date of notification of the owner that the spillway is seriously inadequate. Within 18 months of the date of notification, appropriate remedial mitigating measures should have been taken.

The other deficiencies outlined in the next section should be corrected within 1 year of the date of notification of the owner.

7.2 RECOMMENDED MEASURES

a. After the hydrological investigation has been completed, mitigating measures dealing with the seriously inadequate spillway capacity should be determined.

b. A method of treatment to eliminate or control the seepage which was noted at the downstream toe of the embankment should be designed and constructed.

c. The depression along the crest of the embankment should be filled to assure a minimum crest elevation of 100 (plan datum).

d. All trees and brush growing on the embankment should be cut.

e. The grouted riprap at the base of the auxiliary spillway channel should be repaired. The voids which exist beneath the riprap and the cracks and depressions caused by the voids must be repaired.

f. The void behind the west side wall of the auxiliary spillway should be filled and the wall repaired.

g. An attempt should be made to establish a grass cover on the reconstructed segment of the embankment.

h. The leaning power pole on the crest of the dam should be repaired or replaced.

i. Establish a program to regularly monitor the principal spillway conduit to assure that no differential settlement or joint separation has occurred.

APPENDIX A

PHOTOGRAPHS

Principal Spillway Riser

Interior of Riser and 30 Inch Valve for Reservoir Drain

Principal Spillway Outlet

Downstream Slope of Reconstructed Segment of Dam
Seepage Noted at Toe in This Area

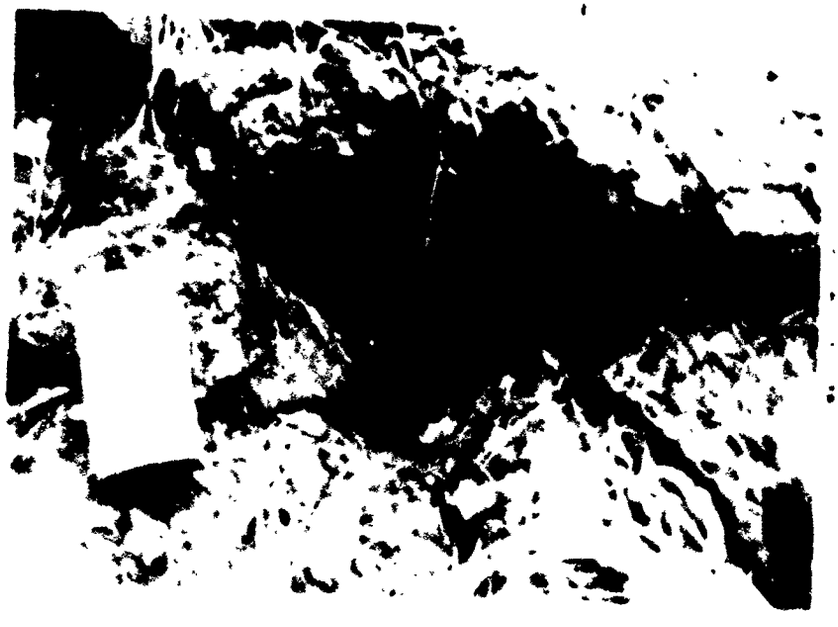
Auxiliary Spillway - Note 4" x 4" Timber on Crest

Auxiliary Spillway - Note Cracking on Western Side Wall

Straps Being Used to Help Support
End Section of Western Side Wall

Void Behind Western Side Wall

Auxiliary Spillway - Deterioration and Voids
Beneath Grouted Riprap



Void Under Grouted Riprap

Downstream Slope - East of Principal Spillway Outlet

Upstream Slope - West of Auxiliary Spillway

APPENDIX B

ENGINEERING DATA CHECKLIST

Check List
Engineering Data
Design Construction Operation

Name of Dam HADLOCK POND

I.D. # 62[illegible]

Item	Remarks		
	Plans	Details	Typical Sections
Dam	1924, [illegible], 1977		
Spillway(s)	1933		
Outlet(s)			
Design Reports	NONE		
Design Computations	↓		
Discharge Rating Curves			
Dam Stability			
Seepage Studies			
Subsurface and Materials Investigations	SOME COMPACTION TESTS & 1 BORING		

Item	Remarks
Construction History	BUILT 1896 - ADDED TO SEVERAL TIMES AUX SPILLWAY RECONSTRUCTED - 1933 PRIN " " - 1977
Surveys, Modifications, Post-Construction Engineering Studies and Reports	
Accidents or Failure of Dam Description, Reports	PIPES FAILED IN 1976; DAM WAS BREATCHED BY ORDER OF DEC
Operation and Maintenance Records Operation Manual	

APPENDIX C

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) **Basic Data**

a. General

Name of Dam HADLOCK POND DAM

I.D. # N.Y 625 (#1098 CHAMPLAIN)

Location: Town WARREN County WASHINGTON

Stream Name BISHOP BROOK ??

Tributary of HALFWAY CREEK

Longitude (W), Latitude (N) W 73° 35.0' N 43° 24.8'

Hazard Category C

Date(s) of Inspection 4/17/79

Weather Conditions 45° OVERCAST

b. Inspection Personnel W. LYNICK, R. WARRENDER

c. Persons Contacted S. CRAIG - LAKE ASSOC. H. GOULD TOWN SUPERVISOR

d. History:

Date Constructed 1896 - MAJOR RECONSTRUCTION 1977

Owner TOWN OF FORT ANN

Designer ORIGINAL - UNKNOWN 1977 RECON. - DANIEL BUCKLEY

Constructed by ORIGINAL - UNKNOWN - GERALD BROWN CONST. Co.

2) **Technical Data**

Type of Dam EARTH & ROCK FILL

Drainage Area 8.79 SQ. M

Height 29' Length 850'

Upstream Slope VARIES 1 on 2 1 on 3 Downstream Slope VARIES 1 on 1 1 on 2

2) Technical Data (Cont'd.)

External Drains: on Downstream Face N/A @ Downstream Toe N/A

Internal Components:

- Impervious Core _____
- Drains _____
- Cutoff Type _____
- Grout Curtain _____

3) Embankment

GRANULAR EARTH & STONE FILL

a. Crest

(1) Vertical Alignment DEPRESSION IN VICINITY OF PRINICIPAL CONDUIT WESTERN END - SLIGHT SLOPE TOWARD DOWNSTREAM SLOPE

(2) Horizontal Alignment CURVED BY DESIGN

(3) Surface Cracks NONE

(4) Miscellaneous THERE WAS A POWER POLE ON THE CREST WHICH WAS LEANING TOWARD THE DOWNSTREAM SLOPE.

b. Slopes

(1) Undesirable Growth or Debris, Animal Burrows SOME TREES & BRUSH GROWING ON SLOPES

(2) Sloughing, Subsidence or Depressions NONE

(3) Slope Protection NONE ON UPSTREAM - DOWNSTREAM SLOPE IS ROCK COVERED

(4) Surface Cracks or Movement at Toe NONE NOTED

(5) Seepage 2 AREAS OF MINOR SEEPAGE - BOTH WERE AT DOWNSTREAM TOE SLIGHTLY EAST OF AUX. SPILLWAY. ON ONE A SLIGHT CLEAR FLOW WAS NOTED. THE OTHER SPOT HAD SMALL POOL BUT FLOW WAS VERY SLIGHT.

(6) Condition Around Outlet Structure ROCK & BOULDER FILL AROUND CONDUIT & PLUNGE POOL

c. Abutments

TIES INTO EXISTING GROUND ON EACH END

(1) Erosion at Embankment and Abutment Contact NONE

(2) Seepage along Contact of Embankment and Abutment NONE VISIBLE

(3) Seepage at toe or along downstream face NONE AT ABUTMENTS

d. Downstream Area - below embankment

WETLANDS BELOW MOST OF DAM - ON EASTERN END A ROCKFILL BERM EXTENDS BEYOND TOE

(1) Subsidence, Depressions, etc. NONE

(2) Seepage, unusual growth WETLANDS - BRUSH & SMALL TREES

(3) Evidence of surface movement beyond embankment toe NONE

(4) Miscellaneous

e. Drainage System

NONE

(1) Condition of relief wells, drains, etc. _____

_____

_____

_____

_____

(2) Discharge from Drainage System _____

_____

_____

4) Instrumentation

(1) Monumentation/Surveys NONE

(2) Observation Wells NONE

(3) Weirs NONE

(4) Piezometers NONE

(5) Other

5) Reservoir

a. Slopes SATISFACTORY

b. Sedimentation NO PROBLEMS EVIDENT

6) Spillway(s) (including tail race channel)

PRINCIPAL - RISER & CONDUIT THROUGH EMBANKMENT

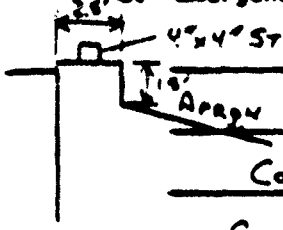
AUXILIARY - CONCRETE CHANNEL THROUGH EMBANKMENT

a. General

b. Principle Spillway 5'x 7' PRECAST CONCRETE RISER - I beam (10") has been added as a flashboard to raise pond level. RISER HAS TRASH RACK & ANTI-VORTEX DEVICE

48" CONCRETE CONDUIT - NO JOINT SEPARATION EVIDENT - ALIGNMENT OF PIPE GOOD

c. Emergency or Auxiliary Spillway CONCRETE CHANNEL



CONCRETE APRON WITH CONCRETE SIDEWALLS 4.2' FROM CREST CONCRETE TO TOP OF DAM. CRACKING OF CONCRETE NOTED ON SIDEWALLS - STOPLOG ADDED TO RAISE CREST & HOLD HIGHER POND LEVEL

d. Condition of DISCHARGE channel DEBRIS ON APRON & TREES PARTIALY BLOCKING CHANNEL CARRYING WATER TO WETLANDS AREA.

e. Stability of Channel side/slopes CONCRETE LINED - VOIDS BEHIND WALL ON WEST SIDE. LARGE VOIDS UNDER PART OF APRON & GROUTED R.P.RAP - THE GROUT PENETRATION FROM THE 1977 GROUTING IS VISIBLE - UNDER THE LAST APRON SLAB

7) Downstream Channel

WETLANDS - SWAMP

a. Condition (debris, etc.) CHANNEL IS FREE FLOWING

b. Slopes NO PROBLEM EVIDENT

c. Approximate number of homes 8 11 DWELLINGS - SOME SUMMER CAMPS & TRAILERS - SEVERAL FULL TIME PERMANENT RESIDENCES 2 TOWN ROAD CULVERTS & BRIDGES ON ROUTE 149

8) Reservoir Drain/Outlet

Type: Pipe ✓ Conduit _____ Other _____

Material: Concrete ✓ Metal _____ Other _____

Size: 48" D.H. OUTLET 30" DIA INLET Length 60' UPSTREAM OF RISER 80' DOWNSTREAM

Invert Elevations: Entrance 75.1 Exit 74.3

Physical Condition (describe): Unobservable _____

Material: CONCRETE

Joints: OKAY - NO SEPERATION OBSERVED Alignment: SATISFACTORY

Structural Integrity: APPEARED SATISFACTORY

Hydraulic Capability: _____

Means of Control: Gate ✓ Valve _____ Uncontrolled _____

Operation: Operable ✓ Inoperable _____ Other _____

Present Condition (describe): GATE OPERATED AT TIME OF INSPECTION - SLIGHT LEAKAGE AT GATE BUT OKAY

9) **Structural**

a. Concrete Surfaces SATISFACTORY

b. Structural Cracking SOME CRACKING ON AUX. SPILLWAY & ON APRON LARGEST CRACKS HAD BEEN PATCHED

c. Movement - Horizontal & Vertical Alignment (Settlement) NONE VISIBLE

d. Junctions with Abutments or Embankments ~~Emergency~~ AUX. SPILLWAY - CHANNEL WALLS CRACKED - VOIDS BEHIND THEM IN SPOTS & HAD 2 SETS OF STRAPS HOLDING THE END SECTION IN PLACE

e. Drains - ~~Foundation~~, Joint, ~~Face~~ RESERVOIR - OPERATED AT TIME OF INSPECTION

f. ~~Water passages~~, conduits, ~~sluices~~ PRINCIPAL SPILLWAY - SATISFACTORY

g. Seepage or Leakage SLIGHT LEAKAGE THROUGH RISER SECTION JOINTS - SECTIONS ~~WERE~~ WERE 2' 4" PRE-CAST CONC. BY FORT MILLER CO.

h. Joints - Construction, etc. No Apparent Separation or Alignment Problems

i. Foundation

j. Abutments

k. Control Gates - Operational 30" Valve

l. Approach & Outlet Channels

m. Energy Dissipators (plunge pool, etc.) Rock & Boulder Plunge Pool

n. Intake Structures

o. Stability

p. Miscellaneous

APPENDIX D

HYDROLOGIC/HYDRAULIC

ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	99.9	265	2635
2) Design High Water (Max. Design Pool)			
3) Auxiliary Spillway Crest	96.3	202	1704
4) Pool Level with Flashboards			
5) Service Spillway Crest	958	194	1604

DISCHARGES

	Volume (cfs)
1) Average Daily	
2) Spillway @ Maximum High Water	312.0
3) Spillway @ Design High Water	
4) Spillway @ Auxiliary Spillway Crest Elevation	4.02
5) Low Level Outlet	117.1
6) Total (of all facilities) @ Maximum High Water	1197
7) Maximum Known Flood	?

CREST: **ELEVATION:** 1

Type: EARTH - W TH SLIGHT DEPRESSION

Width: 16' Length:

Spillover CONCRETE CHANNEL - EMERGENCY SPILLWAY

Location NEAR MIDDLE OF EMBANKMENT

SPILLWAY:

PRINCIPAL		EMERGENCY
96.07	Elevation	96.21
48" CONC. PIPE	Type	CONCRETE OPEN CHANNEL
5' x 7'	Width	30' 1 ON 1 SIDE SLOPES
	Type of Control	
V	Uncontrolled	V
	Controlled:	
N/A	Type (Flashboards; gate)	N/A
N/A	Number	N/A
N/A	Size/Length	N/A
	Invert Material	CONCRETE
	Anticipated Length of operating service	
48" DIA. RC CONDUIT - 80' Long	Chute Length	35Ft
SHARP CRESTED L/b = 1 WEIR LENGTH = 29'	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	1 ft

OUTLET STRUCTURES/EMERGENCY DRAWDOWN FACILITIES:

Type: Gate √ Sluice _____ Conduit √ Penstock _____

Shape : GATE FLAT CIRCULAR CONDUIT-ROUND CONCRETE

Size: _____

Elevations: Entrance Invert 75.1

Exit Invert 74.3

Tailrace Channel: Elevation 68.3

HYDROMETEOROLOGICAL GAGES:

Type : NONE

Location: _____

Records:

Date - _____

Max. Reading - _____

FLOOD WATER CONTROL SYSTEM:

Warning System: NONE

Method of Controlled Releases (mechanisms):

NONE - EXCEPT FOR MANUALLY OPERATED RESERVOIR DRAIN SLIDE GATE

DRAINAGE AREA: 5628 Acres

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Forest

Terrain - Relief: Steep

Surface - Soil: Relatively Permeable

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

None

Potential Sedimentation problem areas (natural or man-made; present or future)

None

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

None

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: None

Elevation:

Reservoir:

Length @ Maximum Pool N/A (Miles)

Length of Shoreline (@ Spillway Crest) N/A (Miles)

DB-15-1 (3/78)
Formerly CA-17

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT GRID

JOB	SHEET NO.	CHECKED BY	DATE
HADLOCK POND DAM	1		
SUBJECT		COMPUTED BY	DATE
HYDROLOGIC/HYDRAULIC COMPUTATIONS		RLW	5/14/79

DRAINAGE AREA = 5628 ACRES = 8.79 SQ MI.

LAKE SURFACE AREA = 194 ACRES

ELEVATION: 1565 (1966) = 454 PLAN DATUM = 95.8

SNYDER SYNTHETIC UNIT HYDROGRAPH:

$L = 6.80$ MI. $L_{CA} = 3.64$ MI.

PMP = 18 IN $C_t \rightarrow C_t = 2.0$

$t_p = C_t (L \cdot L_{CA})^{.3} = (2.0)[(6.8)(3.64)]^{.3} = 5.29$ hours

$t_r = \frac{t_p}{5.5} = \frac{5.29}{5.5} = .95$ hours (Use 1 hour hydrograph = t_r)

$t_{pr} = t_p + .25(t_r - t_r) = 5.24$ hours $+ .25(1 - .95) = 5.25$ hrs

HR @ 33 PMP RAINFALL

ZONE 1 PMP RAIN = 18" (200 mi² - 24 hr)

6 HR 111% 24 HR 132%

12 HR 123% 48 HR 142%

TRSPC = T.F. $= 1 - \frac{.3008}{(8.79)^{.1132}} = .795$

LOSS DATA: 1.0" CONTINUOUS = .1"

BASE FLOW = 2 cfs/50 MI. $2(8.79) = 17.6$ USE 15 cfs

08-15-1 (3/78)
Formerly GA-17

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT GRID

JOB: HADLOCK POND DAM | SHEET NO. 2 | CHECKED BY | DATE

SUBJECT: HYDROLOGIC/HYDRAULIC COMPUTATIONS | COMPUTED BY RLW | DATE 9/12/7?

CONIC METHOD - GENERATION

NORMAL RESERVOIR LEVEL (PLAN DATUM - CONSTRUCTION PLANS) 95.8

SURFACE AREA = 194 ACRES

APEX OF CONE: ELEV. 71.0

CONIC METHOD (AREA-VOLUME) $A = \pi R^2$ $VOL = \frac{1}{3}\pi R^2 h$

ELEV (PLAN DATUM)	RADIUS	AREA (ACRES)	h	VOL (AC-FT)
100.0	1917.8'	265.3	29.0	2564
95.8	1640.1'	194.0	24.8	1603

PRINCIPAL SPILLWAY CAPACITY

COMPUTE PIPE FLOW VS. WEIR FLOW TO DETERMINE WHICH ONE CONTROLS

PIPE FLOW: WATER SURFACE ELEV.	Q (cfs)	WEIR FLOW: WATER SURFACE ELEV.	Q (cfs)
96.21	286.1	96.21	4.02
96.9	291.0	96.9	54.9
97.9	298.0	97.9	185.5
98.6	303.1	98.6	303.6
98.9	304.7	98.9	359.8
99.9	311.5	99.9	568.9

CONTROL LINE

$$Q = A\sqrt{\frac{2gH}{1 + k_e + k_f L}}$$

$$= 12.57\sqrt{\frac{2(32.2)(H)}{1+.5+ 45.4(0.055)/.83}}$$

$$Q = CLH^{3/2}$$

$$= (3.2)(24)(H)^{3/2}$$

00-15-1 (3/78)
Formerly CA-17

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT GRID

JOB	SHEET NO.	CHECKED BY	DATE
HADLOCK POND DAM	3		
SUBJECT		COMPUTED BY	DATE
HYDROLOGIC/HYDRAULIC COMPUTATIONS		RLW	9/13/79

AUXILIARY SPILLWAY CAPACITY

WATER SURFACE ELEVATION	HEAD (ft)	FLOW (cfs)
96.9	.69	67.27
97.9	1.69	257.84
98.2	2.89	407.37
98.9	2.69	517.79
99.9	3.69	831.89

$Q = cLH^{1.5} = (3.32)(35.35)(H)^{1.5}$

RESERVOIR DRAWDOWN CAPACITY

WATER SURFACE AT NORMAL SPILLWAY CREST

$$Q = 4.91\sqrt{\frac{2(32.2)(10.37)}{1 - .5^4 + (.5)^4}} = 117.1 \text{ cfs}$$

```
****************************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION        JULY 1978
LAST MODIFICATION  26 FEB 79
MODIFIED FOR HONEYWELL APR. 79
****************************************

****************************************
THE PROGRAM IS CURRENTLY BEING MODIFIED
TO RUN ON THE CDS HONEYWELL SYSTEM

PLEASE REPORT ANY UNUSUAL OPERATING PROBLEMS
TO THE TILLSON (RM. 423) PH# 7-5666
****************************************
A1 PADDOCK POND DAM
A  PMF WITH RATIOS - ANALYSIS
A3 DATE 7/13/79
B    150     1     0     0     0     0     0     0     0     0
B1     5
J      1     2     1
J1    .5     1
K      0     1                                   1
K1                         INFLOW HYDROGRAPH
M      1     1  8.79                  .795                   1
P      0    18   111   123   132   142
T                                                1    .1
W   5.24  .625
X     15    15     1
K      1     1                                   1
K1 ROUTED HYDROGRAPH AT DAM  NO BREACH
Y                        1     1
Y1     1                                    -96.07    -1
Y4 96.07  96.21  96.9  97.9  98.6  98.9  99.9
Y5     0      4  122.2  443.3  712.4  922.6  1143.4
$A     0    194   330
$E    71   95.6   101
$$ 96.07
$D  99.9  3.087   1.5   600
K      1   1000                                  1
K1 LOCATION  TOE OF DAM
Y                        1     1
```

```
Y1    1
Y6  .05    .05    .05    75    115    75    .33
Y7    0    115    250    75    435    75    435    72    450    72
Y7  450     75    750    75   1500   115
K     1   2400                               1
K1 LOCATION STA 2400
Y                          1      1
Y1    1
Y6  .05    .05    .05    64     95  1400   .006
7     0     95    900    75   1825    67   1825    64   1840    64
Y7 1840     67   2000    75   2150    95
K     1   3020                               1
K1 LOCATION JOE GREENE RD
Y                          1      1
Y1    1
Y6  .05    .05    .05    60     95   620   .006
Y7    0     95    500    75   2000    65   2000    60   2015    60
Y7 2015     65   2500    75   2750    95
K     1   4720                               1
K1 LOCATION RTE 149
Y                          1      1
Y1    1
Y5  .05    .05    .05    35     95  1700   .015
Y7    0     95   1400    55   1730    40   1730    35   1745    35
Y7 1745     40   1800    55   3400    95   .015
K    99
A
A
A
A
A
```

```
******************************
   FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION        JULY 1978
   LAST MODIFICATION  26 FEB 79
   MODIFIED FOR HONEYWELL APR 79
******************************

****************************************
THE PROGRAM IS CURRENTLY BEING MODIFIED
TO RUN ON THE 105 HONEYWELL SYSTEM

PLEASE REPORT ANY UNUSUAL OPERATING PROBLEMS
TO JOEL TILLSON (RM. 423) PH. 7-5666
****************************************

RUN DATE 07/13/79
                    HADLOCK POND DAM
                    PMF WITH RATIOS - ANALYSIS
                    DATE

                                        JOB SPECIFICATION
        NQ      NHR     NMIN    IDAY     IHR     IMIN    METRC    IPLT    IPRT    NSTAN
       150        1        0       0       0        0        0       0       0        0
                                JOPER     NWT    LROPT    TRACE
                                    5       0        0        0

                              MULTI-PLAN ANALYSES TO BE PERFORMED
                                 NPLAN= 1 NRTIO= 2 LRTIO= 1
        RTIOS=   0.50   1.00

**********          **********          **********          **********          **********

                                SUB-AREA RUNOFF COMPUTATION

                                     INFLOW HYDROGRAPH
              ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                  1        0        0        0        0        0        1        0        0

                                       HYDROGRAPH DATA
        IHYDG    IUHG    TAREA    SNAP    TRSDA    TRSPC    RATIO   ISNOW    ISAME    LOCAL
            1       1     8.79      0.     8.79     0.80       0.       0        1        0

                                        PRECIP DATA
                SPFE      PMS       R6      R12      R24      R48      R72      R96
                  0.    16.00   111.00   123.00   132.00   142.00       0.       0.

                                        LOSS DATA
     LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
         0      0.      0.    1.00      0.      0.    1.00    1.00    0.10      0.      0.

                                    UNIT HYDROGRAPH DATA
                               TP=  5.24     CP=0.63     NTA=  0

                                       RECESSION DATA
                        STRTQ=   15.00     QRCSN=   15.00     RTIOR=  1.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.19 AND R= 4.73 INTERVALS

          UNIT HYDROGRAPH 29 END-OF-PERIOD ORDINATES, LAG=  5.25 HOURS, CP= 0.63   VOL= 1.00
        59.      181.      356.      528.      645.      679.      614.      500.      405.      327.
       265.      214.      173.      140.      113.       92.       74.       60.       49.       39.
        32.       26.       21.       17.       14.       11.        9.        7.        6.
```

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	1.00	1	0.01	0.	0.01	15.	1.04	4.00	76	0.	0.	0.	15.
1.01	2.00	2	0.01	0.	0.01	15.	1.04	5.00	77	0.	0.	0.	15.
1.01	3.00	3	0.01	0.	0.01	15.	1.04	6.00	78	0.	0.	0.	15.
1.01	4.00	4	0.01	0.	0.01	15.	1.04	7.00	79	0.	0.	0.	15.
1.01	5.00	5	0.01	0.	0.01	15.	1.04	8.00	80	0.	0.	0.	15.
1.01	6.00	6	0.01	0.	0.01	15.	1.04	9.00	81	0.	0.	0.	15.
1.01	7.00	7	0.02	0.	0.02	15.	1.04	10.00	82	0.	0.	0.	15.
1.01	8.00	8	0.02	0.	0.02	15.	1.04	11.00	83	0.	0.	0.	15.
1.01	9.00	9	0.02	0.	0.02	15.	1.04	12.00	84	0.	0.	0.	15.
1.01	10.00	10	0.02	0.	0.02	15.	1.04	13.00	85	0.	0.	0.	15.
1.01	11.00	11	0.02	0.	0.02	15.	1.04	14.00	86	0.	0.	0.	15.
1.01	12.00	12	0.02	0.	0.02	15.	1.04	15.00	87	0.	0.	0.	15.
1.01	13.00	13	0.12	0.	0.12	15.	1.04	16.00	88	0.	0.	0.	15.
1.01	14.00	14	0.14	0.	0.14	15.	1.04	17.00	89	0.	0.	0.	15.
1.01	15.00	15	0.14	0.	0.14	15.	1.04	18.00	90	0.	0.	0.	15.
1.01	16.00	16	0.40	0.00	0.40	18.	1.04	19.00	91	0.	0.	0.	15.
1.01	17.00	17	0.17	0.07	0.10	29.	1.04	20.00	92	0.	0.	0.	15.
1.01	18.00	18	0.13	0.03	0.10	49.	1.04	21.00	93	0.	0.	0.	15.
1.01	19.00	19	0.01	0.	0.01	75.	1.04	22.00	94	0.	0.	0.	15.
1.01	20.00	20	0.01	0.	0.01	99.	1.04	23.00	95	0.	0.	0.	15.
1.01	21.00	21	0.01	0.	0.01	114.	1.05	0.	96	0.	0.	0.	15.
1.01	22.00	22	0.01	0.	0.01	117.	1.05	1.00	97	0.	0.	0.	15.
1.01	23.00	23	0.01	0.	0.01	107.	1.05	2.00	98	0.	0.	0.	15.
1.02	0.	24	0.01	0.	0.01	92.	1.05	3.00	99	0.	0.	0.	15.
1.02	1.00	25	0.09	0.	0.09	77.	1.05	4.00	100	0.	0.	0.	15.
1.02	2.00	26	0.09	0.	0.09	65.	1.05	5.00	101	0.	0.	0.	15.
1.02	3.00	27	0.09	0.	0.09	56.	1.05	6.00	102	0.	0.	0.	15.
1.02	4.00	28	0.09	0.	0.09	48.	1.05	7.00	103	0.	0.	0.	15.
1.02	5.00	29	0.09	0.	0.09	42.	1.05	8.00	104	0.	0.	0.	15.
1.02	6.00	30	0.09	0.	0.09	37.	1.05	9.00	105	0.	0.	0.	15.
1.02	7.00	31	0.29	0.19	0.10	42.	1.05	10.00	106	0.	0.	0.	15.
1.02	8.00	32	0.29	0.19	0.10	72.	1.05	11.00	107	0.	0.	0.	15.
1.02	9.00	33	0.29	0.19	0.10	130.	1.05	12.00	108	0.	0.	0.	15.
1.02	10.00	34	0.29	0.19	0.10	232.	1.05	13.00	109	0.	0.	0.	15.
1.02	11.00	35	0.29	0.19	0.10	350.	1.05	14.00	110	0.	0.	0.	15.
1.02	12.00	36	0.29	0.19	0.10	475.	1.05	15.00	111	0.	0.	0.	15.
1.02	13.00	37	1.59	1.49	0.10	643.	1.05	16.00	112	0.	0.	0.	15.
1.02	14.00	38	1.91	1.81	0.10	997.	1.05	17.00	113	0.	0.	0.	15.
1.02	15.00	39	2.38	2.28	0.10	1618.	1.05	18.00	114	0.	0.	0.	15.
1.02	16.00	40	6.04	5.94	0.10	2745.	1.05	19.00	115	0.	0.	0.	15.
1.02	17.00	41	2.22	2.12	0.10	4443.	1.05	20.00	116	0.	0.	0.	15.
1.02	18.00	42	1.75	1.65	0.10	6408.	1.05	21.00	117	0.	0.	0.	15.
1.02	19.00	43	0.13	0.03	0.10	8167.	1.05	22.00	118	0.	0.	0.	15.
1.02	20.00	44	0.13	0.03	0.10	9247.	1.05	23.00	119	0.	0.	0.	15.
1.02	21.00	45	0.13	0.03	0.10	9439.	1.06	0.	120	0.	0.	0.	15.
1.02	22.00	46	0.13	0.03	0.10	8761.	1.06	1.00	121	0.	0.	0.	15.
1.02	23.00	47	0.13	0.03	0.10	7516.	1.06	2.00	122	0.	0.	0.	15.
1.03	0.	48	0.13	0.03	0.10	6226.	1.06	3.00	123	0.	0.	0.	15.
1.03	1.00	49	0.	0.	0.	5075.	1.06	4.00	124	0.	0.	0.	15.
1.03	2.00	50	0.	0.	0.	4133.	1.06	5.00	125	0.	0.	0.	15.
1.03	3.00	51	0.	0.	0.	3366.	1.06	6.00	126	0.	0.	0.	15.
1.03	4.00	52	0.	0.	0.	2738.	1.06	7.00	127	0.	0.	0.	15.
1.03	5.00	53	0.	0.	0.	2224.	1.06	8.00	128	0.	0.	0.	15.
1.03	6.00	54	0.	0.	0.	1804.	1.06	9.00	129	0.	0.	0.	15.
1.03	7.00	55	0.	0.	0.	1462.	1.06	10.00	130	0.	0.	0.	15.
1.03	8.00	56	0.	0.	0.	1185.	1.06	11.00	131	0.	0.	0.	15.
1.03	9.00	57	0.	0.	0.	962.	1.06	12.00	132	0.	0.	0.	15.
1.03	10.00	58	0.	0.	0.	781.	1.06	13.00	133	0.	0.	0.	15.
1.03	11.00	59	0.	0.	0.	634.	1.06	14.00	134	0.	0.	0.	15.
1.03	12.00	60	0.	0.	0.	515.	1.06	15.00	135	0.	0.	0.	15.
1.03	13.00	61	0.	0.	0.	419.	1.06	16.00	136	0.	0.	0.	15.
1.03	14.00	62	0.	0.	0.	341.	1.06	17.00	137	0.	0.	0.	15.
1.03	15.00	63	0.	0.	0.	277.	1.06	18.00	138	0.	0.	0.	15.
1.03	16.00	64	0.	0.	0.	226.	1.06	19.00	139	0.	0.	0.	15.

				0.	0.	226.	[illegible]	[illegible]	139	0.	0.	0.	15.
		66	[illegible]	0.	0.	185.	1.06	20.00	140	0.	0.	0.	15.
1.03	[illegible]	67	[illegible]	0.	0.	146.	1.06	21.00	141	0.	0.	0.	15.
1.03	[illegible]	68	[illegible]	0.	0.	112.	1.06	22.00	142	0.	0.	0.	15.
1.03	[illegible]	69	[illegible]	0.	0.	83.	1.06	23.00	143	0.	0.	0.	15.
1.03	[illegible]	70	[illegible]	0.	0.	42.	1.07	0.	144	0.	0.	0.	15.
1.03	22.00	71	[illegible]	0.	0.	27.	1.07	1.00	145	0.	0.	0.	15.
1.03	23.00	72	[illegible]	0.	0.	17.	1.07	2.00	146	0.	0.	0.	15.
1.04	0.	73	[illegible]	0.	0.	16.	1.07	3.00	147	0.	0.	0.	15.
1.04	1.00	74	[illegible]	0.	0.	16.	1.07	4.00	148	0.	0.	0.	15.
1.04	2.00	75	[illegible]	0.	0.	16.	1.07	5.00	149	0.	0.	0.	15.
1.04	3.00	75	[illegible]	0.	0.	15.	1.07	6.00	150	0.	0.	0.	15.

SUM 20.32 16.73 3.59 96697.
(516.)(425.)(91.)(2738.15)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9439.	8218.	3794.	1327.	96680.
CMS	267.	233.	107.	38.	2738.
INCHES		8.72	16.06	16.85	17.05
MM		221.44	407.96	427.96	433.13
AC-FT		4085.	7525.	7895.	7990.
THOUS CU M		5039.	9282.	9738.	9856.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

3.	8.	5.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	9.	14.	24.	37.	49.
57.	53.	53.	46.	39.	33.	28.	24.	21.	18.
21.	30.	68.	116.	175.	238.	327.	499.	808.	1372.
2222.	3209.	4084.	4624.	4720.	4370.	3758.	3113.	2537.	2067.
1643.	1367.	1112.	902.	731.	[illegible]93.	481.	390.	317.	258.
209.	170.	139.	113.	93.	[illegible]3.	56.	41.	21.	13.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
[illegible]	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4720.	4119.	1897.	663.	48340.
CMS	134.	117.	54.	19.	1369.
INCHES		4.36	8.03	8.42	8.53
MM		110.72	203.97	213.98	216.57
AC-FT		2042.	3763.	3947.	3995.
THOUS CU M		2519.	4641.	4869.	4928.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	18.	29.	49.	75.	92.
114.	117.	107.	92.	77.	65.	56.	48.	42.	37.
42.	72.	136.	232.	350.	475.	653.	997.	1616.	2745.
4443.	6406.	8157.	9247.	9439.	8741.	7516.	6226.	5075.	4133.
3366.	2738.	2224.	1804.	1462.	1185.	962.	781.	634.	515.
417.	341.	277.	226.	185.	146.	112.	83.	42.	27.
17.	16.	16.	16.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	15.	15.	15.	15.	15.	15.	15.
15.	15.	15.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

15.	15.	15.	[illegible]	[illegible]	15.	15.	15.	15.	15.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9439.	8248.	3796.	1327.	96680.
CMS	267.	233.	107.	38.	2738.
INCHES		8.72	10.06	10.85	17.05
MM		221.44	407.96	427.96	433.13
AC-FT		4085.	7525.	7895.	7990.
THOUS CU M		5039.	9282.	9738.	9856.

HYDROGRAPH ROUTING

ROUTED HYDROGRAPH AT DAM NO BREACH

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.	0.	0.	1	1	0	0	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.	0.	0.	-96.	-1

STAGE	96.07	96.21	96.90	97.90	98.60	98.90	99.90
FLOW	0.	4.00	122.20	443.30	712.40	822.60	1143.40
SURFACE AREA	0.	194.	330.				
CAPACITY	0.	1604.	2951.				
ELEVATION	71.	96.	101.				

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
98.1	0.	0.	0.	0.	0.	0.	0.

DAM DATA

TOPEL	COQD	EXPD	DAMWID
99.9	3.1	1.5	600.

STATION 1, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	2.	2.	2.
3.	4.	5.	8.	11.	12.	14.	14.	15.	15.
15.	16.	17.	24.	32.	43.	59.	81.	118.	223.
392.	660.	980.	1343.	3069.	3910.	4000.	3670.	3191.	2708.
2280.	1917.	1622.	1384.	1207.	1123.	1073.	1017.	958.	897.
834.	769.	702.	639.	573.	515.	460.	415.	375.	337.
312.	271.	245.	216.	193.	173.	154.	138.	123.	115.
109.	102.	96.	91.	85.	81.	76.	71.	67.	64.
60.	57.	53.	50.	48.	45.	43.	40.	38.	36.
34.	32.	31.	29.	28.	26.	25.	24.	23.	22.
21.	20.	19.	18.	18.	17.	16.	16.	15.	15.
14.	14.	13.	13.	13.	12.	12.	12.	11.	11.
11.	11.	10.	10.	10.	10.	10.	10.	9.	9.
9.	9.	9.	9.	9.	9.	9.	9.	8.	8.

STORAGE

[illegible]	[illegible]	1657.	1659.	1660.	1661.	1661.	1662.	1662.	1663.
1663.	1664.	1664.	1665.	1665.	1666.	1667.	1668.	1671.	1674.
1673.	1683.	1687.	1690.	1693.	1695.	1697.	1698.	1698.	1699.
1699.	1700.	1703.	1709.	1718.	1732.	1751.	1780.	1825.	1901.
2024.	2205.	2499.	2696.	2891.	2978.	2987.	2954.	2904.	2851.
2[illegible]	2752.	2709.	2666.	2628.	2586.	2540.	2490.	2437.	2384.
2332.	2281.	2233.	2189.	2147.	2109.	2074.	2042.	2012.	1984.
1958.	1935.	1915.	1897.	1880.	1866.	1853.	1842.	1832.	1822.
1814.	1805.	1796.	1791.	1785.	1778.	1773.	1767.	1762.	1757.
1753.	1749.	1745.	1741.	1738.	1735.	1732.	1729.	1726.	1724.
1721.	1719.	1717.	1715.	1714.	1712.	1711.	1709.	1708.	1707.
1705.	1704.	1703.	1702.	1702.	1701.	1700.	1699.	1699.	1698.
1697.	1697.	1696.	1696.	1695.	1695.	1695.	1694.	1694.	1694.
1693.	1693.	1693.	1693.	1692.	1692.	1692.	1692.	1692.	1692.
1691.	1691.	1691.	1691.	1691.	1691.	1691.	1691.	1691.	1690.

STAGE

96.1	96.1	96.1	96.1	96.1	96.1	96.1	96.1	96.1	96.1
96.1	96.1	96.1	96.1	96.1	96.1	96.1	96.1	96.1	96.2
96.2	96.2	96.2	96.2	96.2	96.3	96.3	96.3	96.3	96.3
96.3	96.3	96.3	96.3	96.4	96.6	96.5	96.7	96.9	97.2
97.7	98.3	99.3	100.2	100.8	101.1	101.1	101.0	100.9	100.7
100.5	100.3	100.2	100.1	100.0	99.8	99.7	99.5	99.3	99.1
98.9	98.8	98.6	98.4	98.2	98.1	97.9	97.8	97.7	97.6
97.5	97.5	97.3	97.2	97.1	97.1	97.0	96.9	96.9	96.9
96.6	96.6	96.7	96.7	96.7	96.7	96.6	96.6	96.6	96.6
96.5	96.5	96.5	96.5	96.5	96.4	96.4	96.4	96.4	96.4
96.4	96.3	96.4	96.4	96.3	96.3	96.3	96.3	96.3	96.3
96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3
96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3
96.3	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2
96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2

PEAK OUTFLOW IS 4000. AT TIME 47.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4000.	3359.	1693.	655.	47950.
CMS	113.	95.	48.	19.	1358.
INCHES		3.55	7.17	8.32	8.46
MM		90.29	182.04	211.34	214.82
AC-FT		1666.	3358.	3899.	3963.
THOUS CU M		2054.	4142.	4809.	4888.

STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	1.	1.	1.	1.	1.	1.	1.	2.
2.	2.	2.	2.	2.	3.	3.	3.	4.	9.
15.	22.	28.	33.	36.	38.	40.	41.	41.	41.
41.	42.	46.	55.	70.	92.	122.	200.	321.	527.
865.	1590.	4635.	7237.	8652.	8950.	8391.	7371.	6243.	5201.
4311.	3571.	2981.	2460.	2051.	1721.	1458.	1258.	1138.	1090.
1030.	978.	917.	856.	792.	724.	657.	592.	529.	469.
419.	377.	339.	305.	273.	245.	220.	197.	177.	159.
143.	129.	119.	112.	106.	100.	95.	90.	85.	81.
76.	73.	69.	65.	62.	59.	56.	54.	51.	49.
47.	44.	43.	41.	39.	37.	36.	35.	33.	32.
31.	30.	29.	28.	27.	26.	26.	25.	24.	24.
23.	23.	22.	22.	21.	21.	20.	20.	20.	19.
19.	19.	19.	19.	18.	18.	18.	18.	17.	17.
17.	17.	17.	17.	17.	16.	16.	16.	16.	16.

STORAGE

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]	1681.	[illegible]	1683.	1684.	1685.	1687.	1687.	1689.
1673.	1671.	1672.	1673.	1674.	1675.	1677.	1680.	1684.	1691.
1699.	1707.	1716.	1720.	1724.	1727.	1728.	1729.	1730.	1729.
1723.	1731.	1734.	1746.	1765.	1793.	1831.	1885.	1972.	2117.
2337.	2703.	[illegible]	3276.	3393.	3417.	3372.	3289.	3193.	3101.
3013.	2744.	2177.	2422.	2770.	2726.	2681.	2641.	2600.	2556.
2507.	2455.	2402.	2350.	2298.	2249.	2203.	2159.	2118.	2080.
2045.	2013.	1985.	1960.	1937.	1917.	1899.	1883.	1869.	1857.
1845.	1835.	1826.	1818.	1810.	1803.	1796.	1790.	1784.	1779.
1773.	1768.	1764.	1760.	1756.	1752.	1748.	1745.	1742.	1739.
1736.	1734.	1732.	1729.	1727.	1725.	1724.	1722.	1720.	1719.
1716.	1716.	1715.	1714.	1713.	1712.	1711.	1710.	1709.	1709.
1708.	1707.	1707.	1706.	1706.	1705.	1705.	1704.	1704.	1704.
1703.	1703.	1703.	1702.	1702.	1702.	1702.	1701.	1701.	1701.
1701.	1701.	1700.	1700.	1700.	1700.	1700.	1700.	1700.	1700.

STAGE

96.1	96.1	96.1	96.1	96.1	96.1	96.1	96.1	96.1	96.1
96.1	96.1	96.1	96.1	96.2	96.2	96.2	96.2	96.2	96.2
96.3	96.3	96.4	96.4	96.4	96.4	96.4	96.4	96.4	96.4
96.4	96.4	96.5	96.5	96.6	96.7	96.9	97.1	97.5	98.1
99.5	100.4	101.3	101.9	102.3	102.3	102.2	102.0	101.7	101.4
101.2	101.0	100.8	100.6	100.4	100.3	100.2	100.0	99.9	99.7
99.6	99.5	99.2	99.0	98.8	98.6	98.5	98.3	98.1	98.0
97.4	97.1	97.6	97.5	97.4	97.3	97.2	97.1	97.1	97.0
97.0	96.9	96.9	96.8	96.8	96.8	96.7	96.7	96.7	96.7
96.6	96.6	96.6	96.6	96.5	96.5	96.5	96.5	96.5	96.5
96.5	96.5	96.4	96.4	96.4	96.4	96.4	96.4	96.4	96.4
96.4	96.4	96.4	96.4	96.3	96.3	96.3	96.3	96.3	96.3
96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3
96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3
96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3	96.3

PEAK OUTFLOW IS 4950. AT TIME 46.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4950.	7673.	3538.	1315.	98184.
CMS	253.	217.	100.	37.	2724.
INCHES		0.12	14.90	16.70	16.97
MM		206.26	380.37	424.24	430.91
AC-FT		3855.	7017.	7826.	7949.
THOUS CU M		4893.	8955.	9653.	9805.

•••••••••• •••••••••• •••••••••• •••••••••• ••••••••••

HYDROGRAPH ROUTING

LOCATION: TOE OF DAM

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1000	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.	0.	0.	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.	0.	0.	0.	0

NORMAL DEPTH CHANNEL ROUTING

QIN(1)	QIN(2)	JN(3)	ELMVT	ELMAX	RLNTH	SEL

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FORMULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 0.50	RATIO 2 1.00	RATIOS APPLIED TO FLOWS
HYDROGRAPH AT	1	8.79 (0.00)	1	4720. (133.65)	9439. (267.30)	
ROUTED TO	1	8.79 (0.00)	1	4000. (113.27)	8950. (253.42)	
ROUTED TO	1000	8.79 (0.00)	1	4000. (113.27)	8951. (253.46)	
ROUTED TO	2400	8.79 (0.00)	1	3979. (112.66)	9039. (255.85)	
ROUTED TO	3020	8.79 (0.00)	1	3973. (112.51)	9027. (255.61)	
ROUTED TO	4720	8.79 (0.00)	1	3982. (112.77)	9027. (255.62)	

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	96.07	96.07	99.90
STORAGE	1657.	1657.	2605.
OUTFLOW	0.	0.	1143.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	101.11	1.21	2967.	4000.	12.00	47.00	0.
1.00	102.33	2.43	3417.	8950.	17.00	46.00	0.

PLAN 1 STATION 1000

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	4000.	75.3	47.00
1.00	8951.	75.8	46.00

PLAN 1 STATION 2400

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	3975.	70.7	47.00
1.00	9039.	72.2	46.00

PLAN 1 STATION 3020

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	3973.	68.0	47.00
1.00	9027.	69.4	46.00

PLAN 1 STATION 4720

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	3982.	44.9	47.00
1.00	9027.	47.5	46.00

```
*** * ************************ ******
FL..  ..... .. . .ACKAGE (HEC-1)
D.. ....... ....... .  JULY 1978
  . ....... .... 26 FEB 79
  ... ..... FOR HONEYWELL APR 79
***********************************

************************************
THIS PROGRAM IS CURRENTLY BEING MODIFIED
TO RUN ON THE GCOS HONEYWELL SYSTEM

PLEASE REPORT ANY UNUSUAL OPERATING PROBLEMS
TO THE TILESH.. (EXT. 4233) ... 7-5665
*** ********************************
    1          A1 HADLOCK POND DAM
    2          A PMF WITH RATIOS - ANALYSIS
    3          A3 DATE  7/-/79
    4          B    150     1     0     0     0     0     0     0     0     0
    5          B1     5
    6          J      1     2     1
    7          J1    .5     1
    8          K      0     1                             1
    9          K1                       INFLOW HYDROGRAPH
   10          M      1     1  8.79                .795                   1
   11          P      0    18   111   123   132   142
   12          T                                        1    .1
   13          W   5.24  .625
   14          X     15    15     1
   15          K      1     1                             1
   16          K1 ROUTED HYDROGRAPH AT DAM  NO BREACH
   17          Y                        1     1
   18          Y1     1                                -96.07    -1
   19          Y4 96.07 96.21  96.9  97.9  98.6  98.9  99.9
   20          Y5     0     6 122.2 443.3 712.4 822.6 1143.4
   21          $A     0   194   330
   22          $E    71  95.8   101
   23          $$ 96.07
   24          $D  99.9 3.087   1.5   800
   25          $B    20    .5    75     2 96.07  99.9
   26          K      1  1000                             1
   27          K1 LOCATION  TOE OF DAM
```

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIOS APPLIED TO FLOWS
				.50	1.00	
HYDROGRAPH AT	1	5.79	1	4720.	9439.	
	(	0.00)	(	133.65)(	267.30)(	
ROUTED TO	1	5.79	1	11972.	14012.	
	(	0.00)	(	339.00)(	396.77)(	
ROUTED TO	1000	5.79	1	11966.	14010.	
	(	0.00)	(	338.91)(	396.72)(	
ROUTED TO	2400	5.79	1	11691.	13869.	
	(	0.00)	(	331.04)(	392.72)(	
ROUTED TO	3020	5.79	1	11520.	13764.	
	(	0.00)	(	326.21)(	389.77)(	
ROUTED TO	4720	5.79	1	11498.	13591.	
	(	0.00)	(	319.91)(	384.87)(	

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	96.07	96.07	99.90
STORAGE	1657.	1657.	2605.
OUTFLOW	0.	0.	1143.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	101.54	3.64	2802.	11972.	2.68	46.00	44.00
1.00	101.80	3.90	2952.	14012.	3.00	44.00	42.00

PLAN 1 STATION 1000

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	11968.	75.8	46.00
1.00	14010.	75.9	44.00

PLAN 1 STATION 2400

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	11691.	72.7	46.00
1.00	13869.	73.1	44.00

PLAN 1 STATION 3 20

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	11520.	69.8	46.00
1.00	13764.	70.2	44.00

PLAN 1 STATION 4720

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	11298.	48.2	46.00
1.00	13591.	48.8	44.00

APPENDIX E

REPORTS FROM PRIOR INSPECTIONS

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

DAM REPORT

1098 Cham

Sheet 223

July 17, 1916
(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Hadlock Pond Dam.

This dam is situated upon the a mountain Brook (Give name of stream) in the Town of Fort Ann, Washington County, about one mile (State distance) from the Village ~~or City~~ of W. Fort Ann

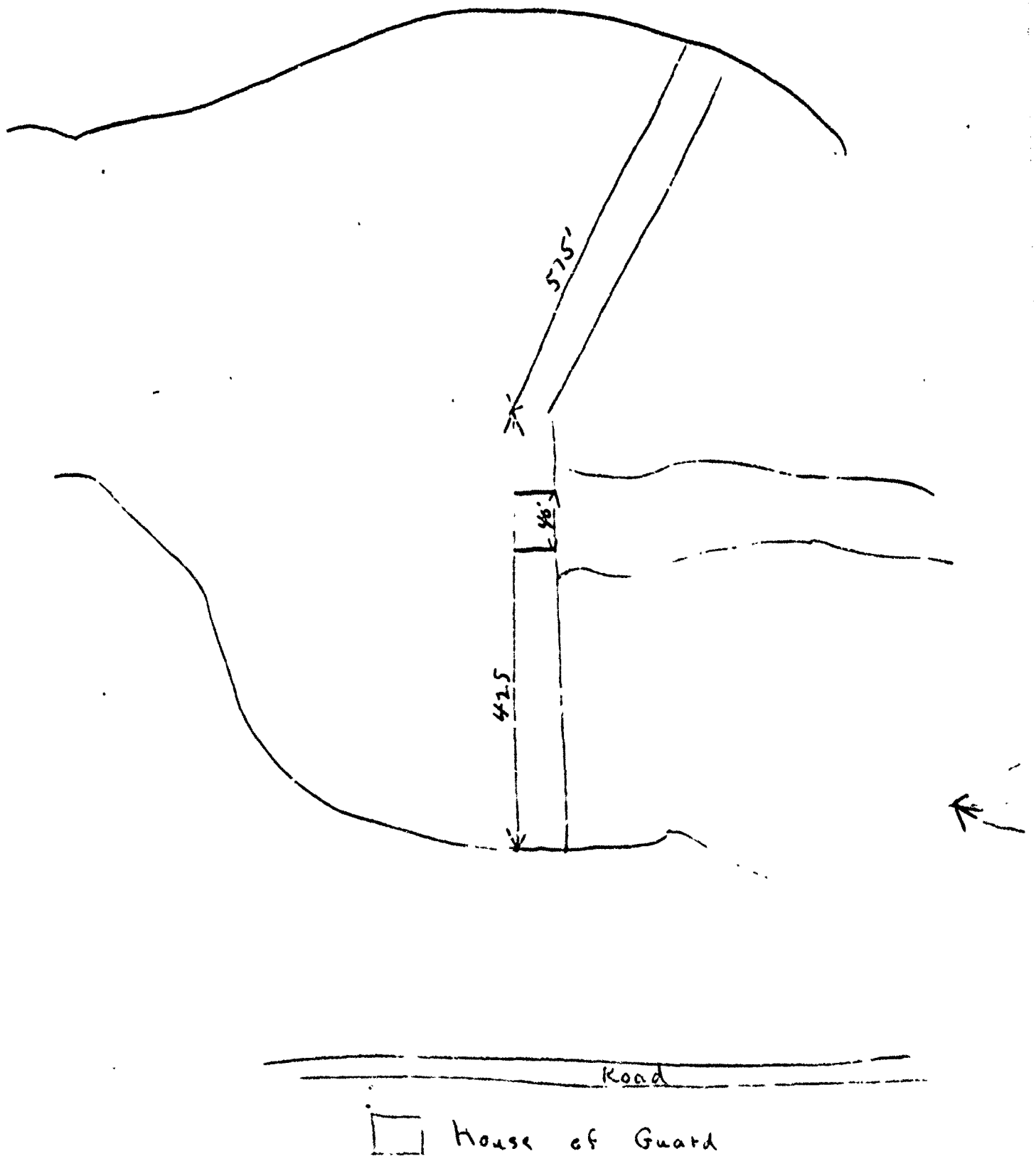
The distance down (Up or down) stream from the dam, to the Highway bridge (Give name of nearest important stream or of a bridge), is about one mile (State distance)

The dam is now owned by Kanes Falls Electric Co Kanes Falls N.Y. (Give name and address in full) and was built in or about the year 1896, and was extensively repaired or reconstructed during the year ——.

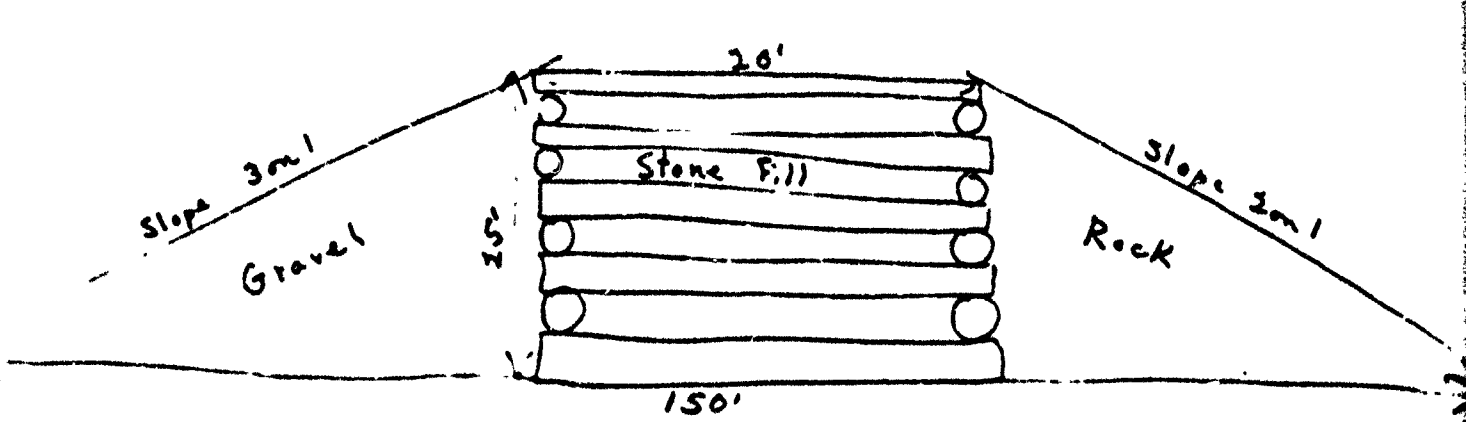
As it now stands, the spillway portion of this dam is built of timber stone fill (State whether of masonry, concrete or timber) and the other portions are built of Timber stone fill (State whether of masonry, concrete, earth or timber with or without rock fill)

As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is hard pan and under the remaining portions such foundation bed is hardpan

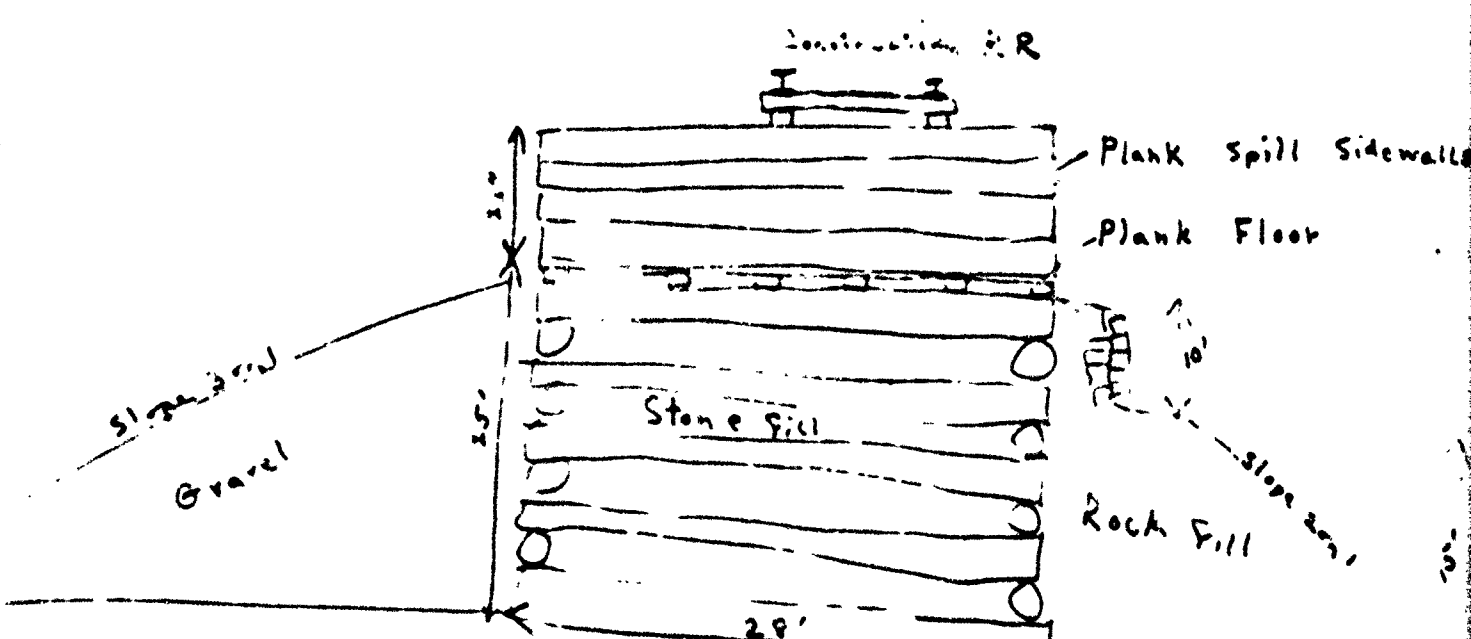
(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings or other conspicuous objects in the vicinity.)



(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)



Spillway



2 - 30" Steel Waste Pipes

set in concrete

The total length of this dam is 1000' feet. The spillway or waste-weir portion, is about 40 feet long, and the crest of the spillway is about 22 inches feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: Two 30" drainage pipes Thru bottom of dam

At the time of this inspection the water level above the dam was ft. 4 in. below above the crest of the spillway.

(State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

Condition of dam good

Reported by [signature]
(Signature)

110 Stadium Ct
(Address—Street and number, P. O. Box or R. F. D. route)

Evanston Ill.
(Name of city)

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION
Raymond T. Schuler, Commissioner

1220 Washington Avenue, State Campus, Albany, New York 12226

June 17, 1977

Mr. Louis M. Concra, Jr.
Dept. of Environmental Conservation
Office of Environmental Analysis
50 Wolf Road
Albany, New York 12205

Dear Mr. Concra:

Subject: Application No. 558-06-0117
Hadlock Pond Dam
Washington County

This is to advise you of our dissatisfaction with the work which has been done on the reconstruction of this dam up to the present time. As we stated in our letter to you dated April 25, the manner in which the design of this project has been progressed is such that critical aspects of the design may not be apparent until the time of construction. The Engineer-in-Charge for this project has, in our opinion, chosen to ignore his responsibility to account for these critical aspects, thereby jeopardizing the future safety of the dam. We base our present concern on the field inspection made on June 15, by Robin Warrender of this Bureau along with Mr. S. Zeccolo of your office.

We have the following major comments regarding the construction.

1. Condition number 16 specified on the permit has not been met. A boring was to be progressed prior to the installation of the new reinforced concrete drain to determine whether some type of cutoff was necessary to prevent seepage beneath the dam. We understand that this boring will be progressed this week, however since the pipe has been placed and backfilled it is extremely unlikely that any adverse conditions identified by a boring would be corrected since remedial treatment could involve removing some of the material which has already been placed.

2. We feel that it is unlikely that pipe placement and backfilling have been properly performed. It does not appear that the trench in which the new pipe was placed was properly dewatered. It is clear that fill is now being placed in the water which partially surrounds the pipe, thereby rendering compaction impossible. This construction method will result in a permanent weak spot in the most critical area of the dam.

3. Since the fill material which is being used is only marginally acceptable, based on laboratory gradation tests performed by this Bureau on samples taken on June 15, we recommend that continuous monitoring (sampling and testing) be employed to insure that the material does not fall outside the specification limits.

4. No compaction tests have been performed on the fill which has already been placed or the material upon which the pipe was bedded. The specifications state that the impervious fill material should be compacted to 95% density as determined by ASTM D1556. Without proper testing it is impossible to assure that this degree of compaction is being achieved. Since this dam is in the "C" hazard classification, we feel that more frequent testing should be required.

Very truly yours,

Lyndon H. Moore, Director
Soil Mechanics Bureau

By

Bernard E. Butler
Associate Soils Engineer

RLW:MVM

DATE
STARTED 6-21-77
FINISHED 6-21-77
SHEET 1 OF 1

EMPIRE SOILS INVESTIGATIONS, INC.

SUBSURFACE LOG

HOLE NO. B-1
SURF. ELEV.
G. W. DEPTH See Note #1

PROJECT Hadlock Pond Dam
LOCATION Fort Ann, New York

DEPTH	SAMPLES	SAMPLE NO	BLOWS ON SAMPLER 0/6	6/12	12/18	N	BLOW ON CASING C	SOIL OR ROCK CLASSIFICATION	NOTES
0									Note #1 With casing advanced to 25.0', water @ 23.7'. After removal of casing, boring caved @ 5.0'.
15		1	8	4	4	8		Brown fine SAND and SILT, little fine gravel, with lenses of Gray Silt, Some fine Sand, and Brown Silt and fine Sand, trace roots (Moist - Loose)	
20		2	25	15	18	33		Gray SILT, little fine sand, grades trace clay (Wet - Compact)	
25		3	26	16	34	50		Gray very fine SAND, little silt with trace embedded coarse sand and fine gravel. Grades Green fine SAND, little silt, with little embedded coarse sand and fine gravel (Moist - Compact)	
30		4	25	46	42	88		Green-gray fine to coarse SAND and GRAVEL, little silt	
35		5	54	76	57	133		(Wet - Very Compact)	
								End of Boring @ 36.5'	
40									

N = No blows to drive 2 "spoon 12 "with 140 lb pen wt falling 30 "per blow
C = No blows to drive ____ "casing ____ "with ____ lb weight falling ____ "per blow
METHOD OF INVESTIGATION 3¼" Hollow Stem Auger Casing

CLASSIFICATION Visual by R. Donnelly - Geologist

EMPIRE SOILS INVESTIGATIONS, INC.

Project: Hadlock Pond Dam — Report No. 1

Client: Gerald R. Brown — Date: June 21, 1977

Contractor: Gerald R. Brown — Job No. AT-7032

Test No.	Date of Test 1977	Depth or Elevation	In-place Density (pcf)	In-place Moisture (%)	% Compaction	Proctor Code	Location and Remarks
1	6/21	*92	133.3	4.0	95.1	1	22' West of Concrete Manhole (On Line)
2	6/21	*92	134.7	4.1	96.1	1	10' South of Concrete Manhole (On Line)
3	6/21	*92	138.2	4.8	98.6	1	18' S.W. of Concrete Manhole
							NOTE: THE ABOVE COMPACTION DATA DEPICTS
							DENSITY CONDITIONS AT LOCATIONS AND ELEVATIONS
							INDICATED ONLY. TESTS PERFORMED IN ACCORDANCE
							WITH SAND CONE METHOD ASTM D-1556.

Proctor Code	Maximum Density (pcf)	Optimum Moisture (%)	Material Type and Source
1	140.2	7.1	Brown fine to coarse Sand & Gravel, little silt (Ashley Haven's Pit

Remarks: *Grade of elevation.

Inspection Time:

Inspector: Richard Donnelly

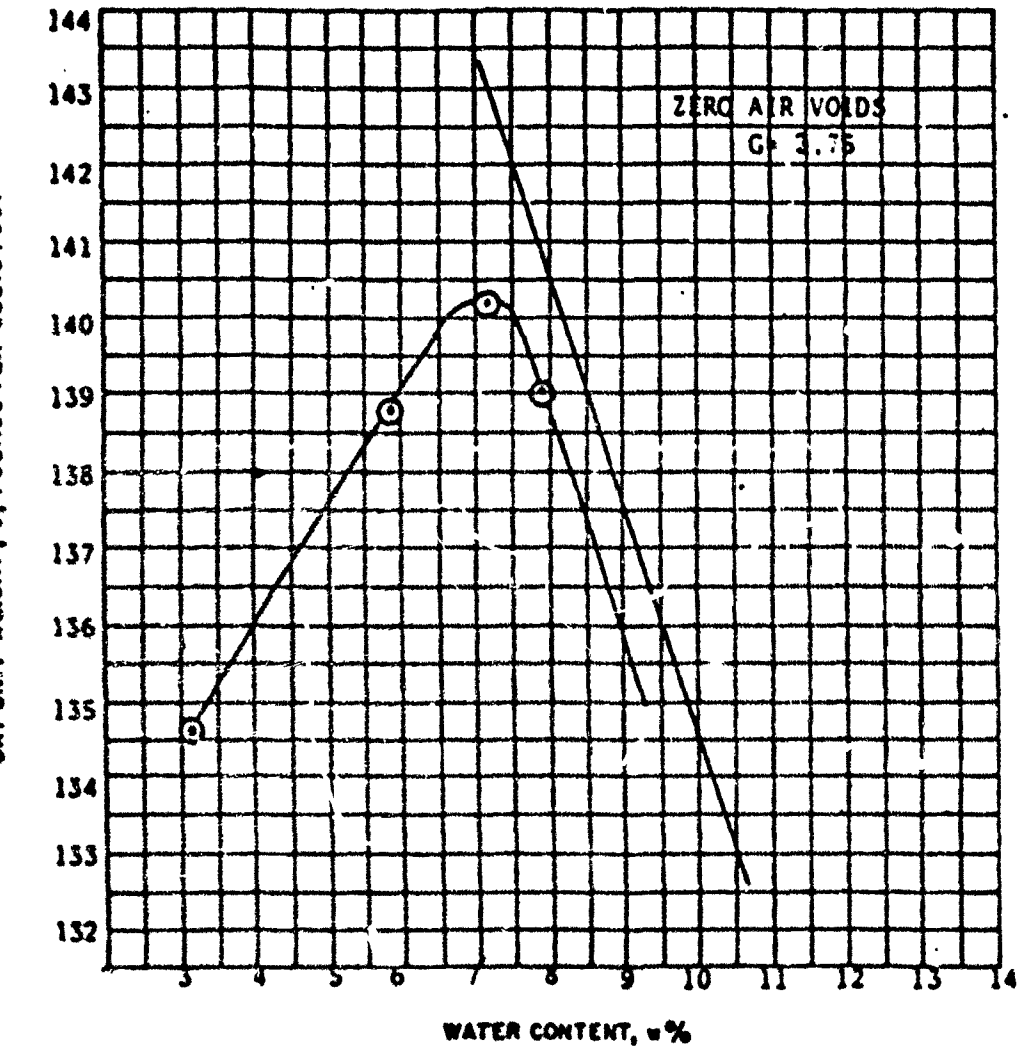
Respectfully submitted,
EMPIRE SOILS INVESTIGATIONS, INC.

Fred A. Dente, C.E.

	ASTM D 698-64T)				ASTM D 1557-64T)			
MOLD DIAMETER, INCHES	4		6		4		6	
MOLD VOLUME, CUBIC FEET	0.033		0.075		0.033		0.075	
RAMMER WEIGHT, POUNDS	5.5		5.5		10		10	
RAMMER DROP, INCHES	12		12		18		18	
NUMBER OF LAYERS	3		3		5		5	
NUMBER OF BLOWS	25		56		25		56	
MAXIMUM MATERIAL SIZE	#4	3/4"	#4	3/4"	#4	3/4"	#4	3/4"
METHOD	A	C*	B	D*	A	C*	B	D*

*OVERSIZE MATERIAL MAY BE REPLACED WITH MATERIAL BETWEEN 3/4" AND THE #4 SIEVE. (NOTE 2 IN ASTM SPECIFICATIONS.)

MOISTURE-DENSITY RELATION



GRADATION OF SAMPLE	
SIEVE SIZE	% FINER BY WEIGHT
3	
3/4	
#4	
#10	
#40	
#100	

MAXIMUM DRY DENSITY 140.2 POUNDS PER CUBIC FOOT, OPTIMUM WATER CONTENT 7.1 %

SAMPLE INFORMATION: Sample No. 7-448
Brown fine to coarse SAND and GRAVEL, little silt (Ashley Haven's Pit)

METHOD OF TEST: ASTM D-1557 Method C

EMPIRE SOILS INVESTIGATIONS, INC.

PROCTOR COMPACTION TEST #1

Hadlock Pond Dam
Fort Ann, New York

DR. BY FAD	CK'D --	DATE: 6-23-77	PROJ NO AT-7032

APPENDIX F

REFERENCES

APPENDIX F

REFERENCES

1) U.S. Department of Commerce, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, May 1961.

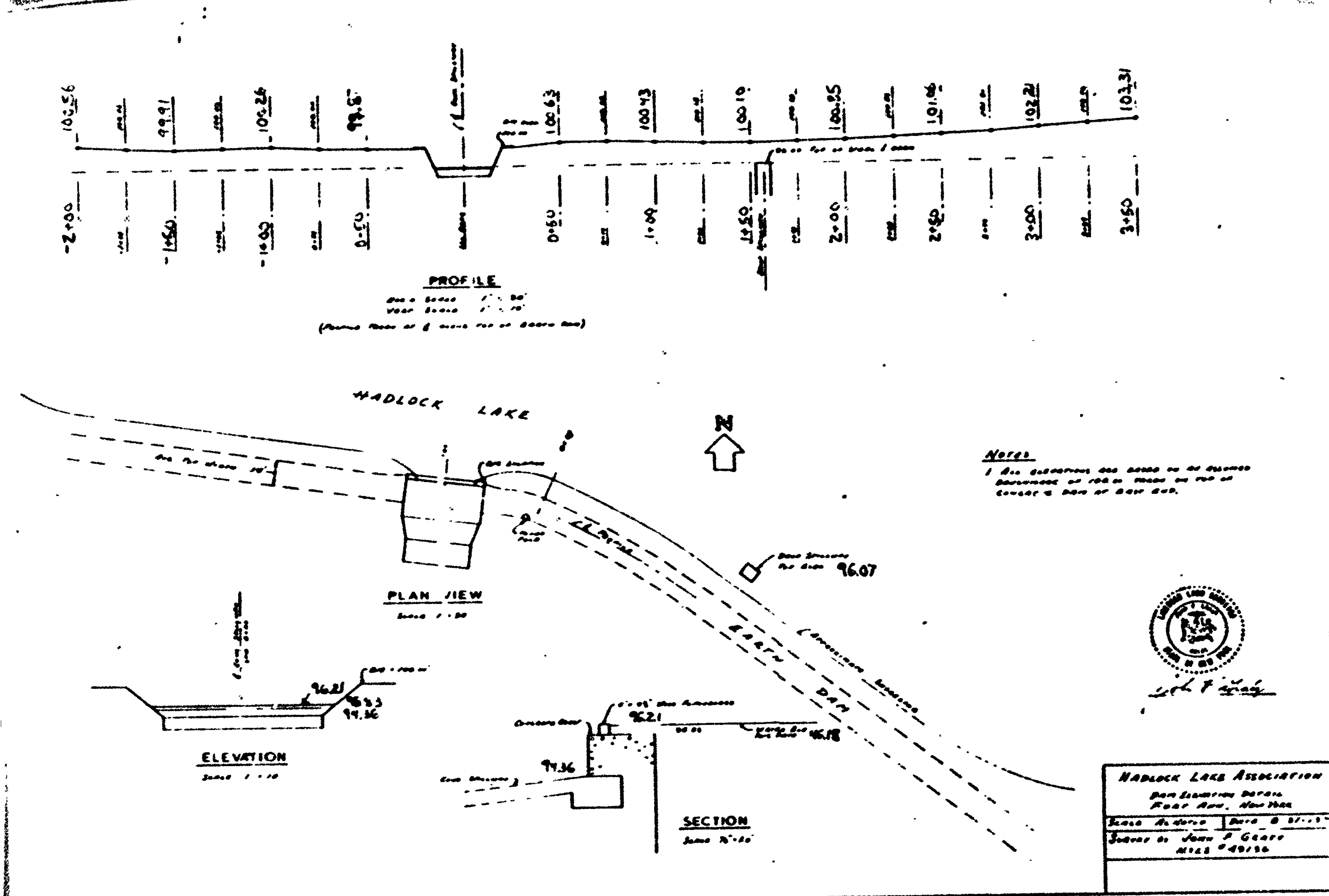
2) H.W. King and E.F. Brater, Handbook of Hydraulics, 5th edition, McGraw-Hill, 1963.

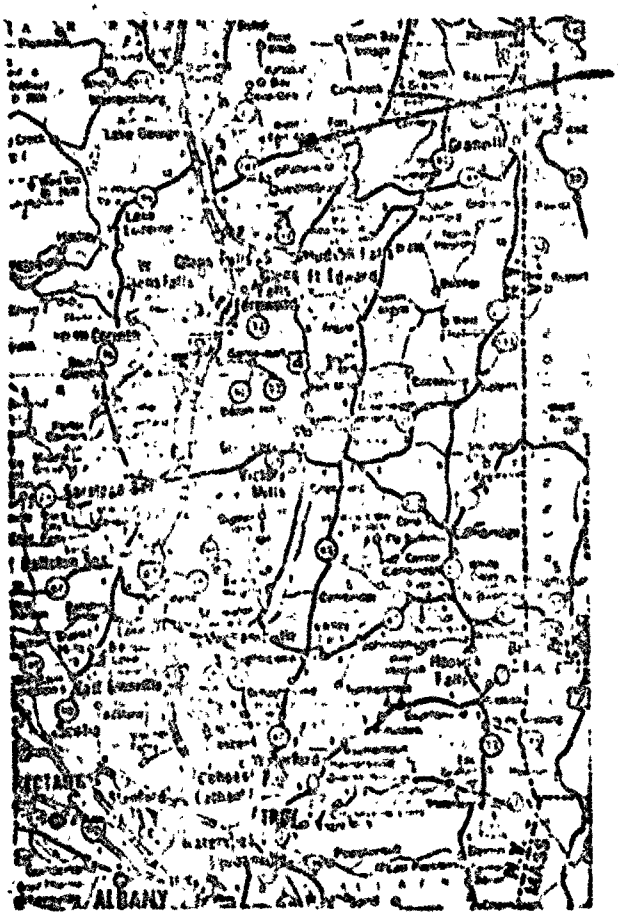
3) University of the State of New York, Geology of New York, Education Leaflet 20, Reprinted 1973.

4) Elwyn E. Seelye, Design, 3rd edition, John Wiley and Sons, Inc., 1960

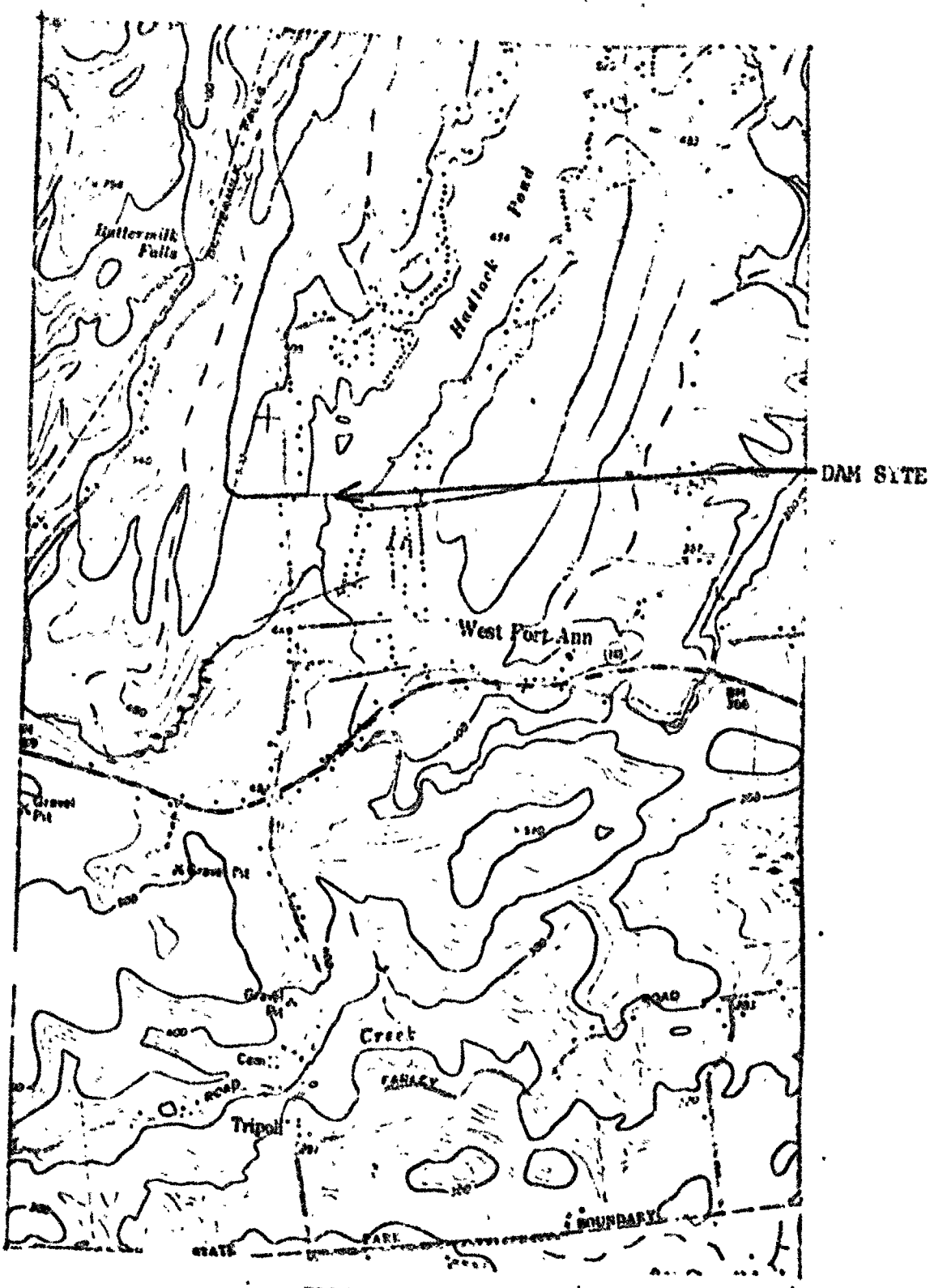
APPENDIX G

DRAWINGS

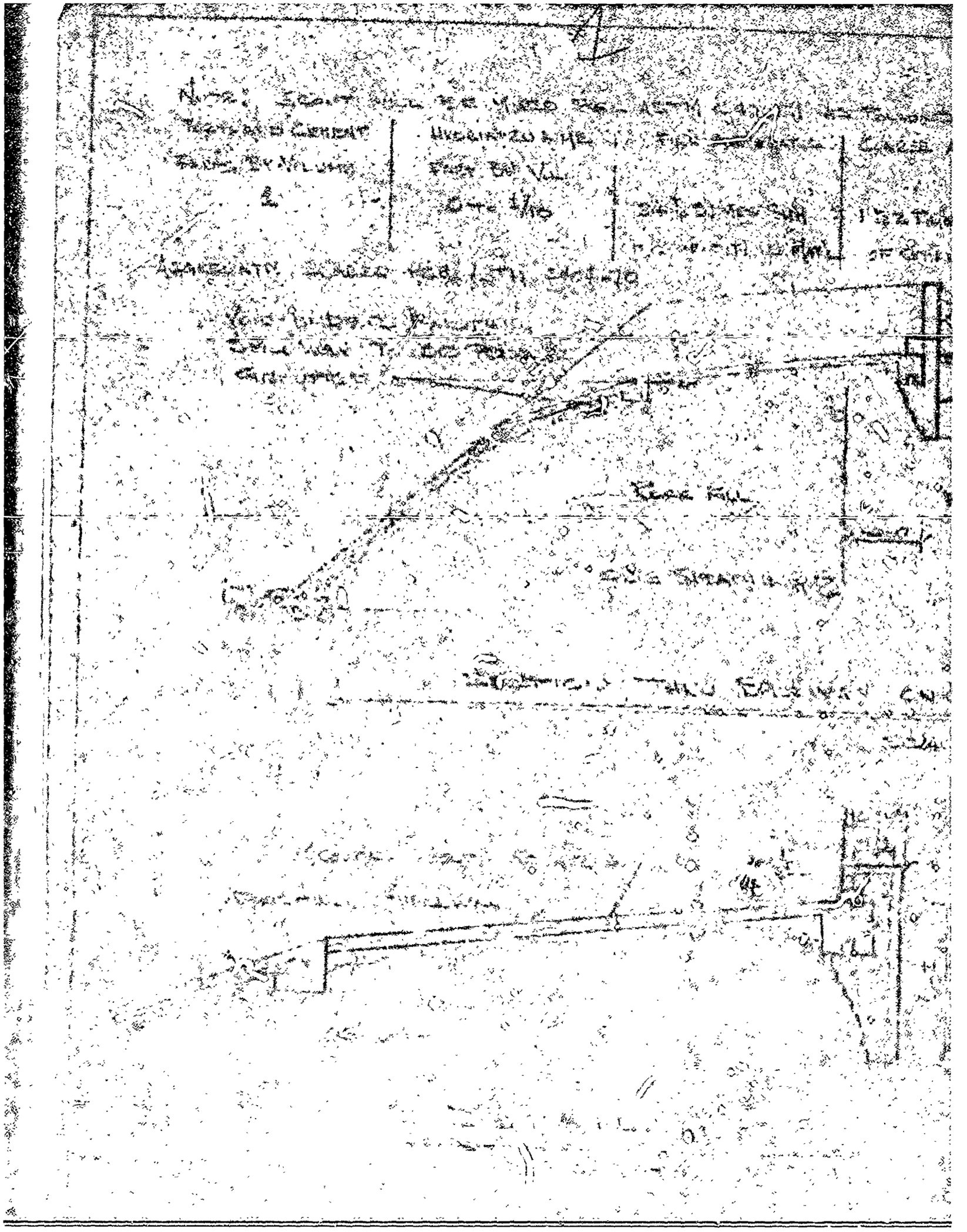

PROFILE
-2+00
-1+50
-1+00
0-50
0+50
1+00
1+50
2+00
2+50
3+00
3+50
102.56
99.91
100.26
100.63
100.43
100.10
100.85
101.06
102.21
103.31
HADLOCK LAKE
N
PLAN VIEW
EARTH DAM
96.07
Notes
ELEVATION
96.21
94.36
SECTION
96.18
HADLOCK LAKE ASSOCIATION
Fort Ann, New York

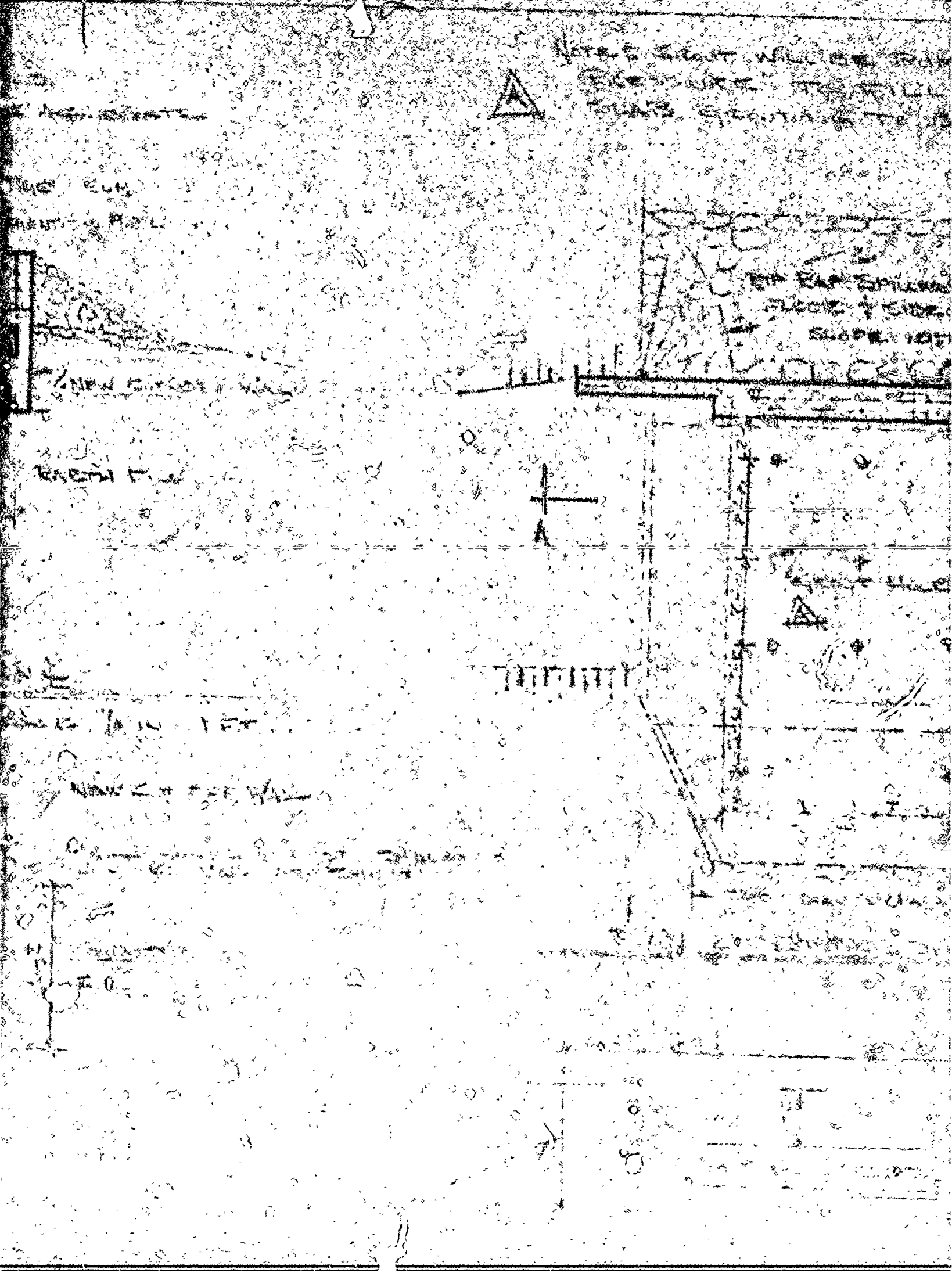


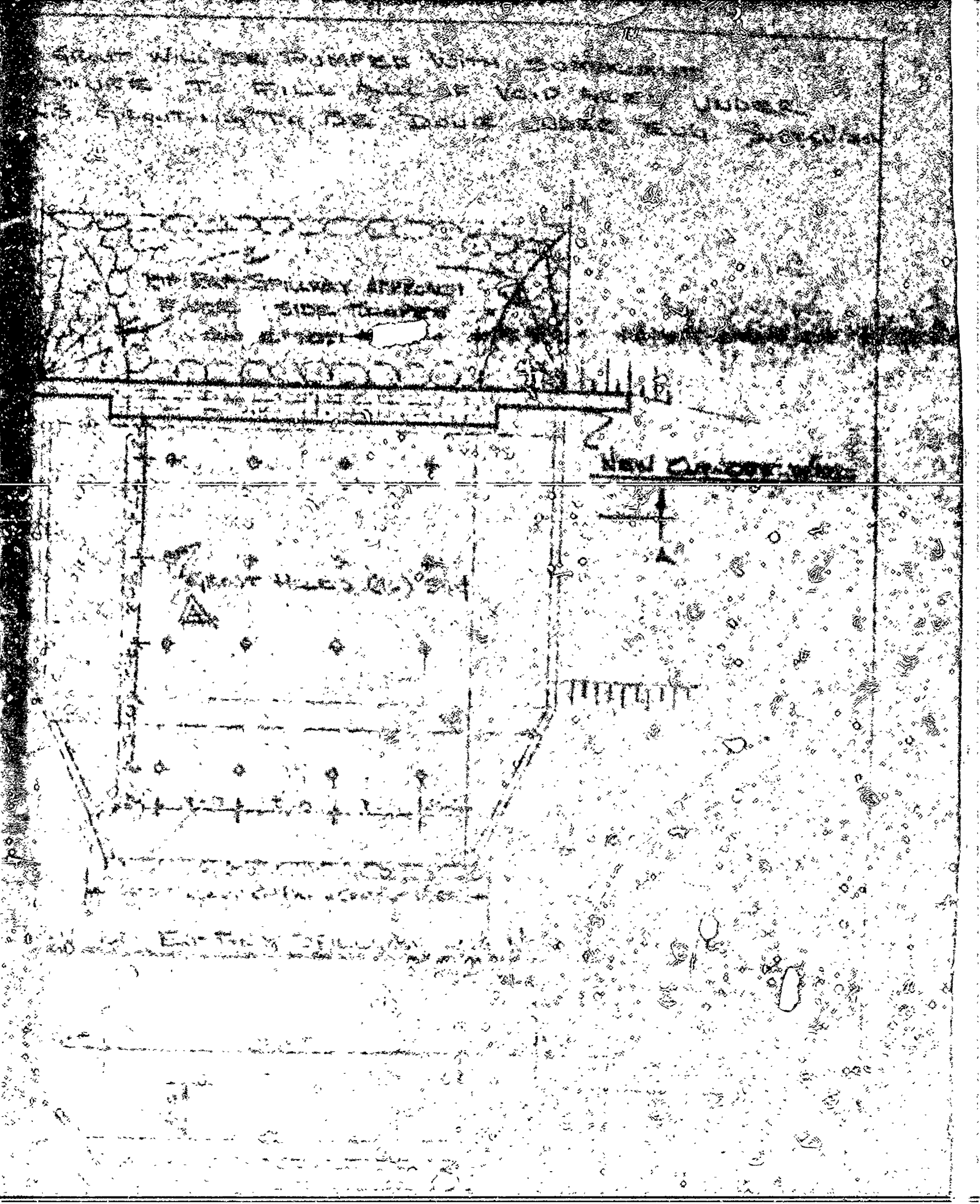
VICINITY MAP
HADLOCK POND DAM
I.D. NO. N.Y. 625

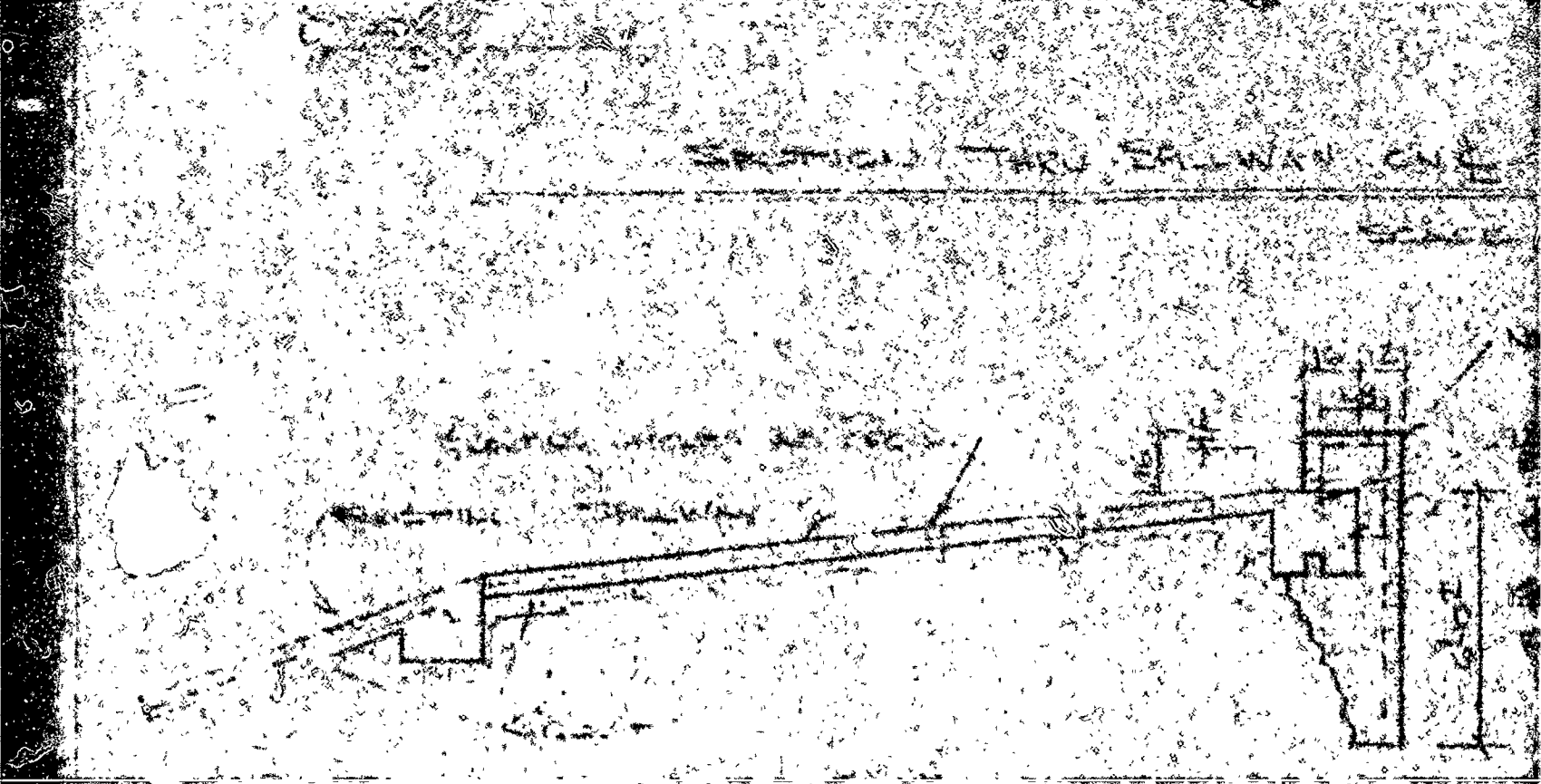


TOPOGRAPHIC MAP
HADLOCK POND DAM
I.D. NO. N.Y. 625



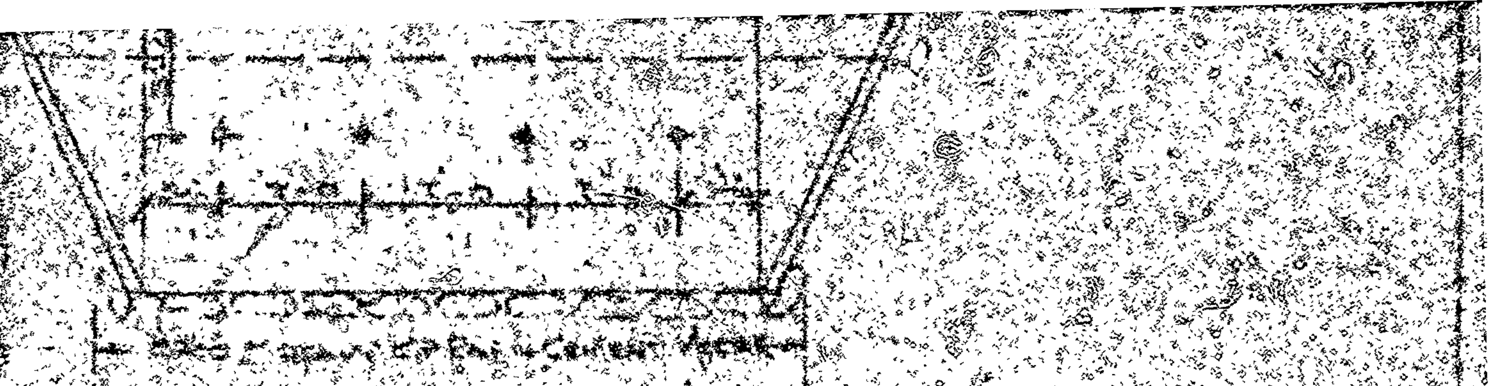




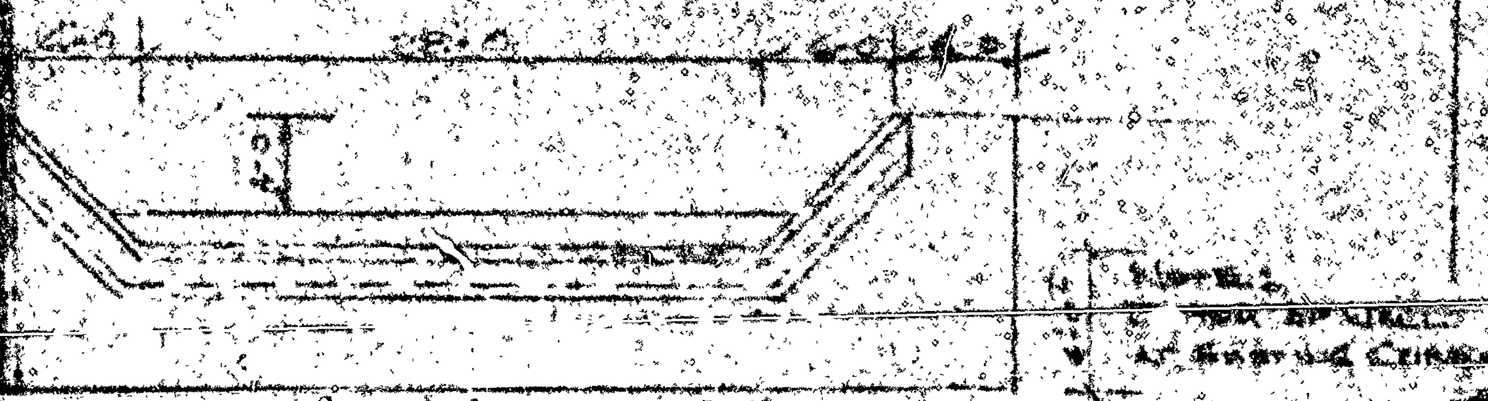


DETAIL (A)

SCALE 1/4" = 1'-0"

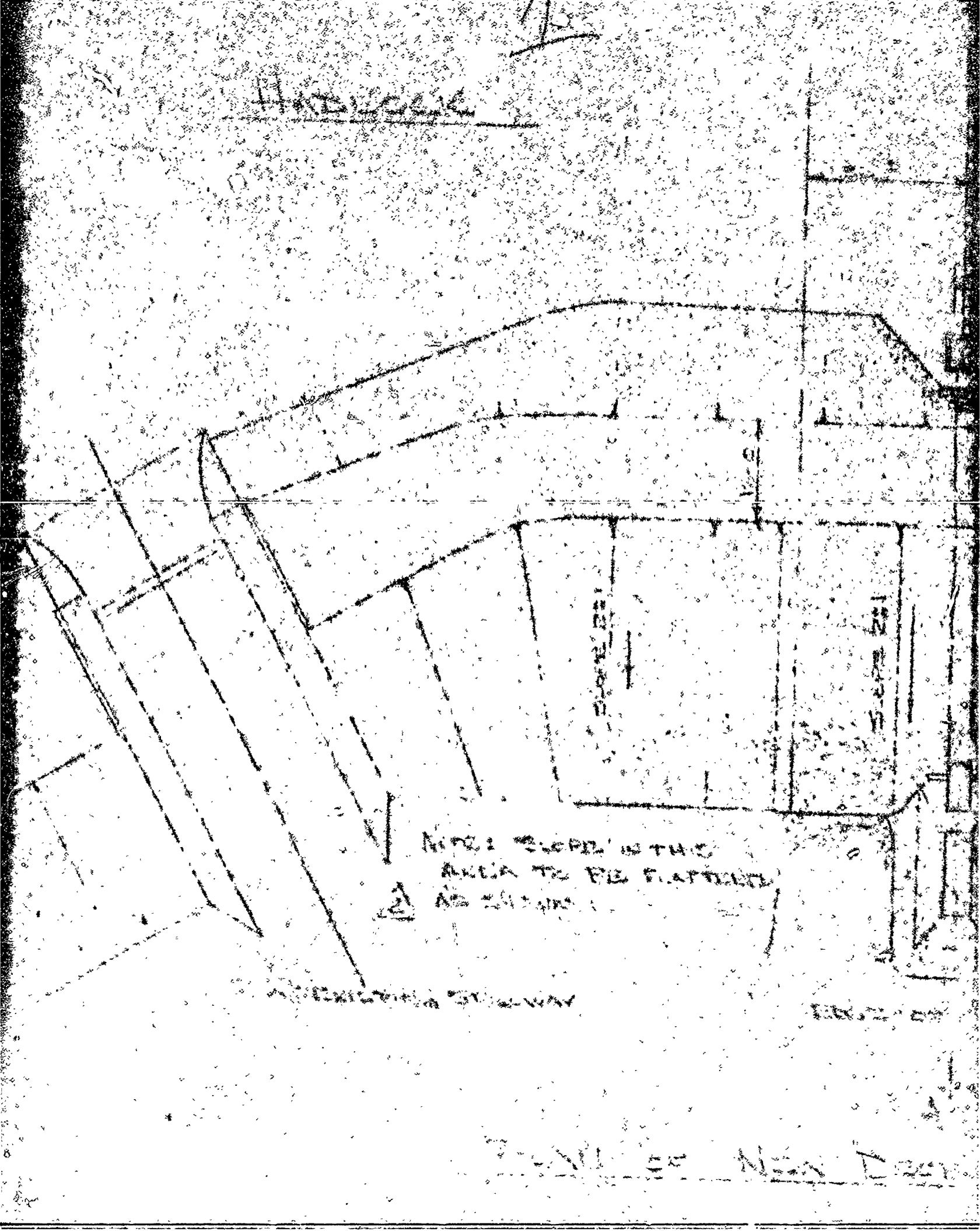


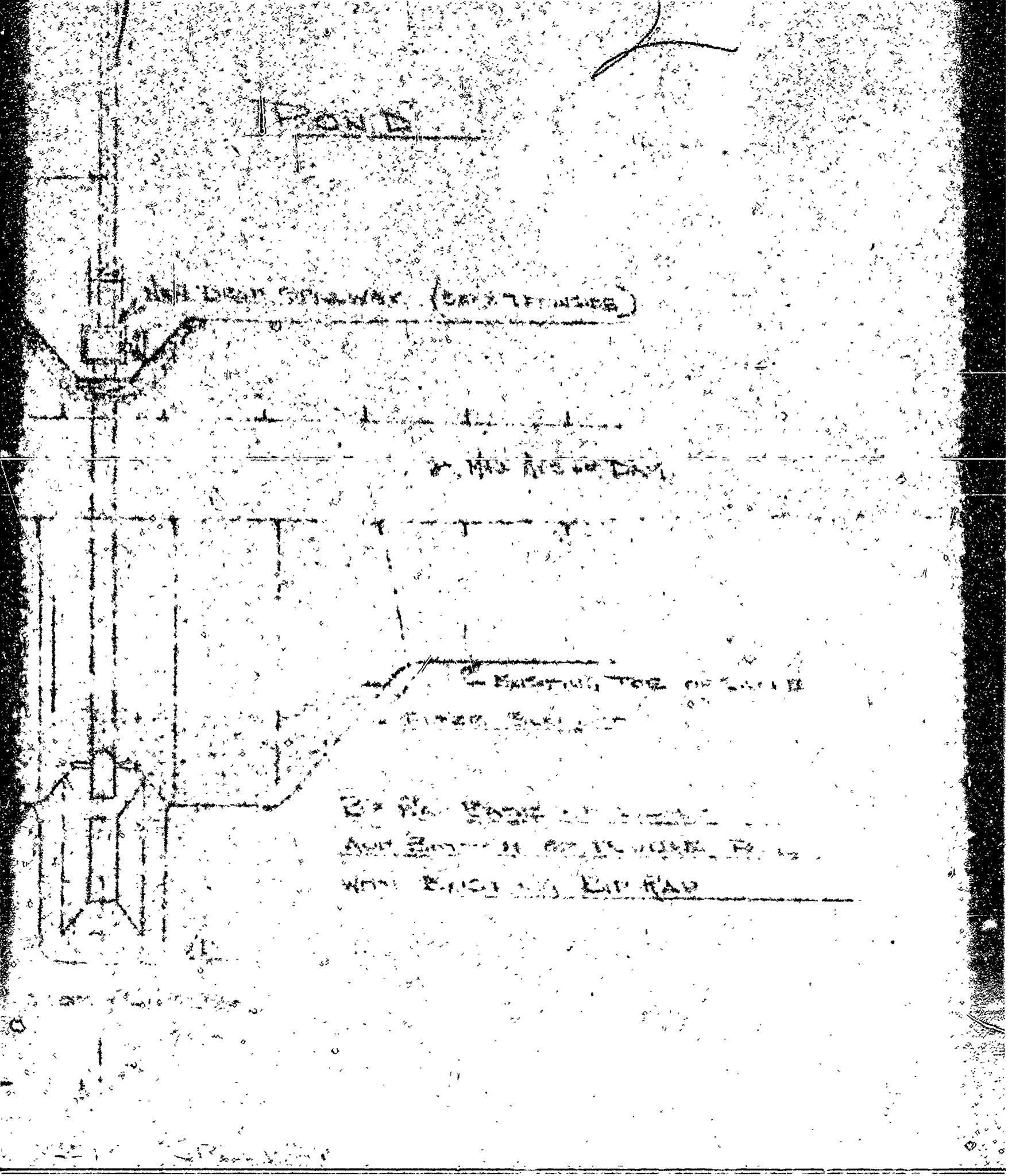
AN OF EXISTING SPILLWAY AND NEW CROSS WALL

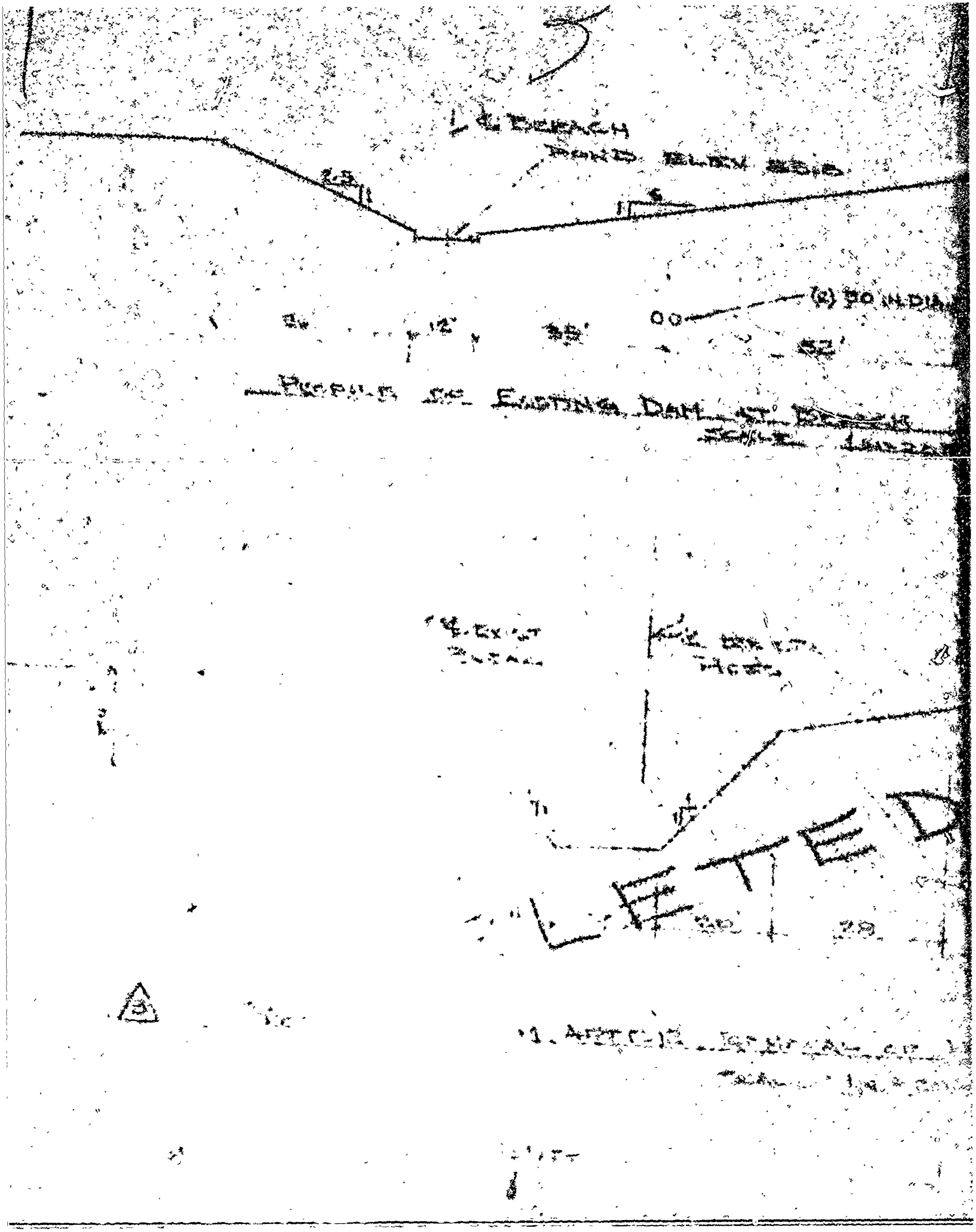


SECTION A-A

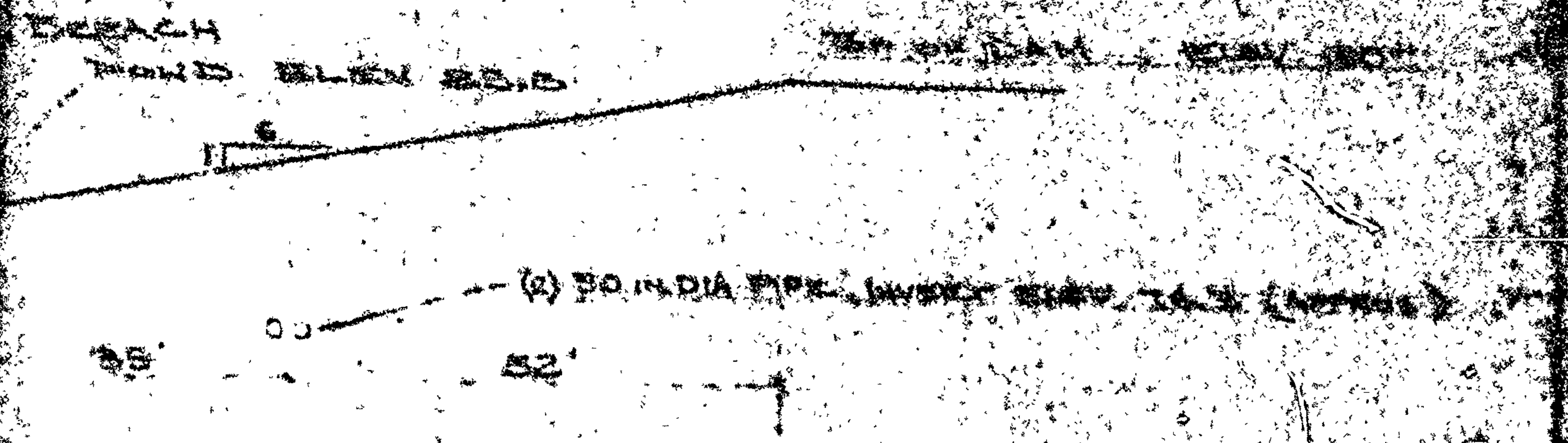
HADLOCK POND





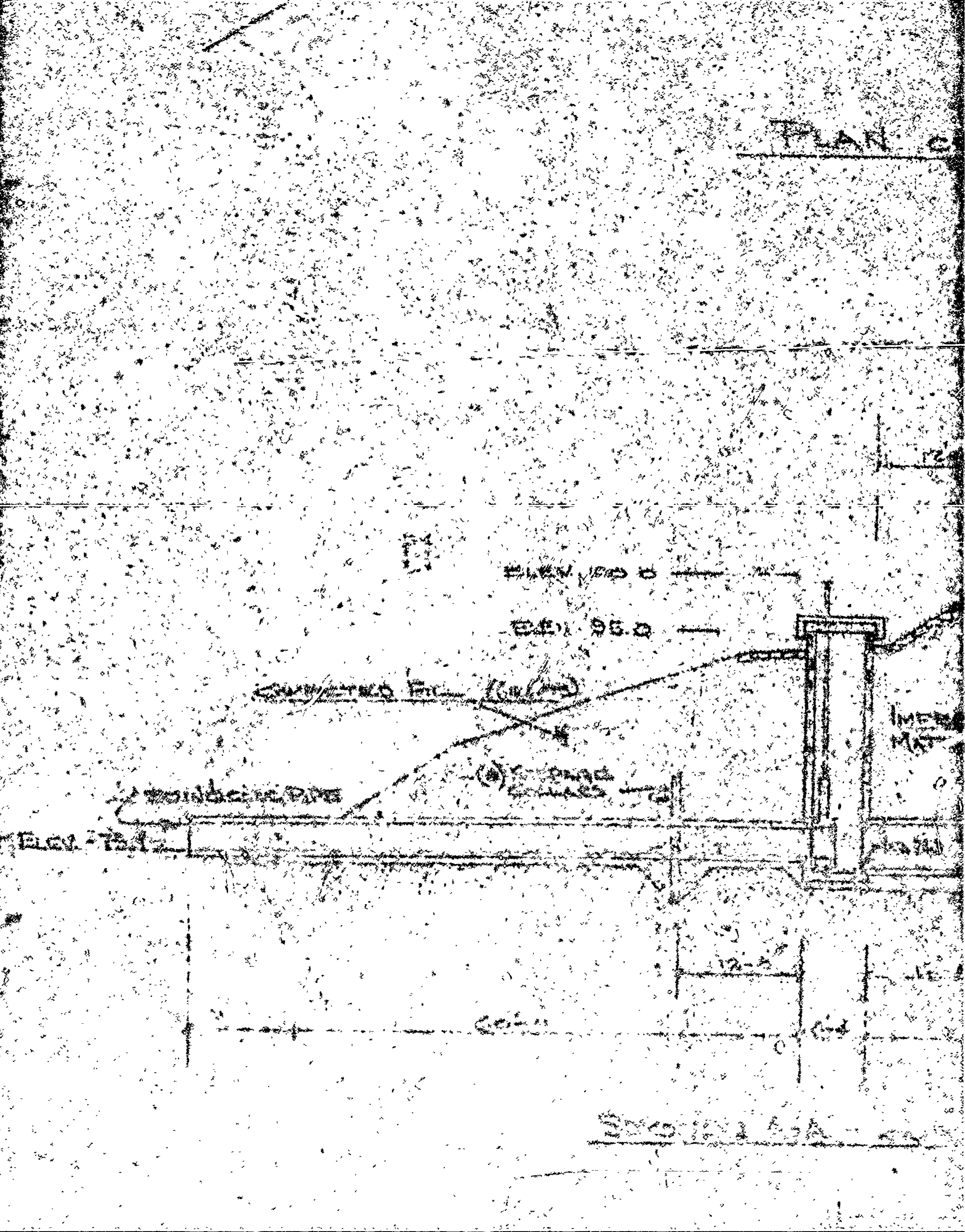

BEACH
POND ELEV
(2) 30 IN DIA
12'
32'
EXISTING DAM

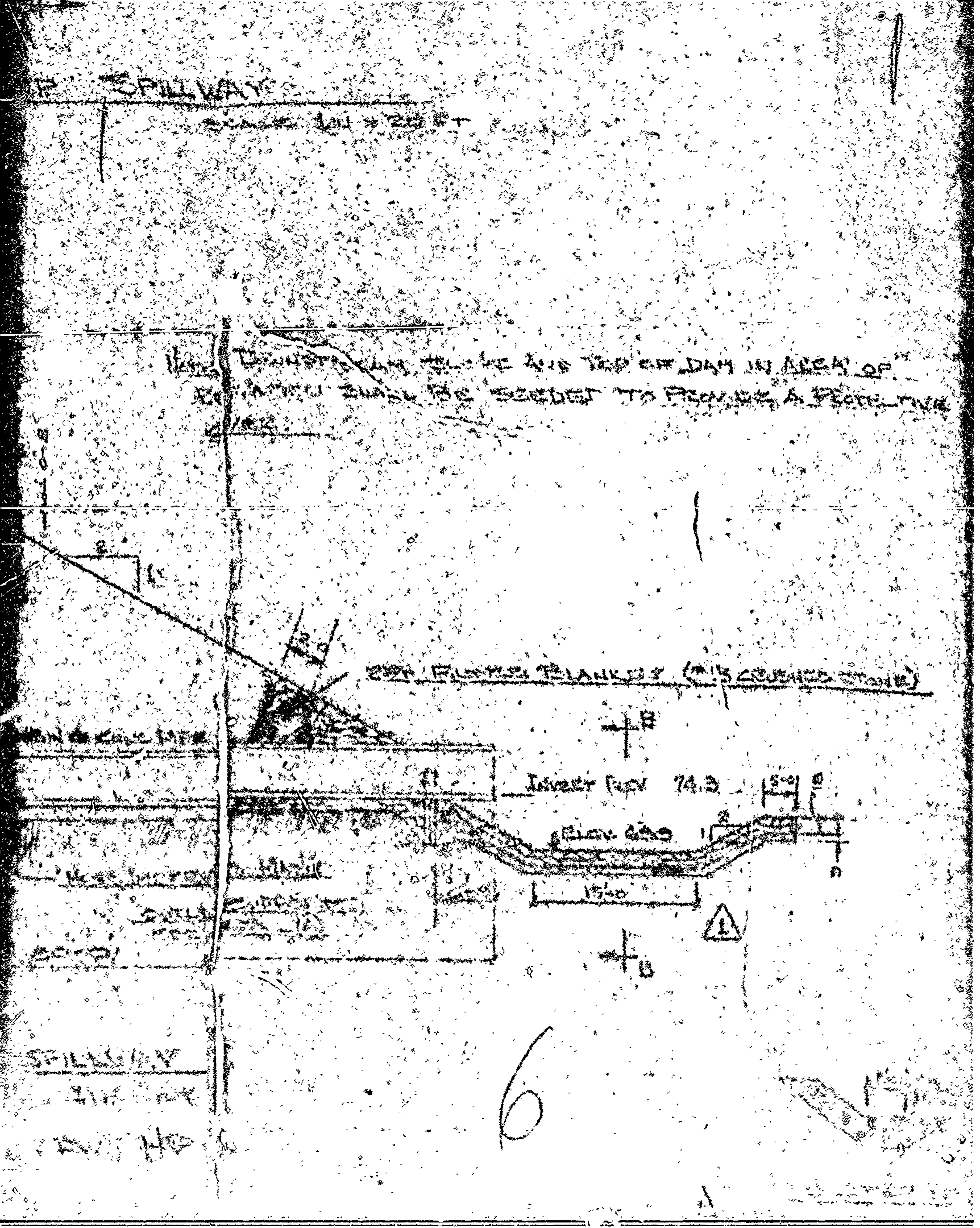
3 / 4

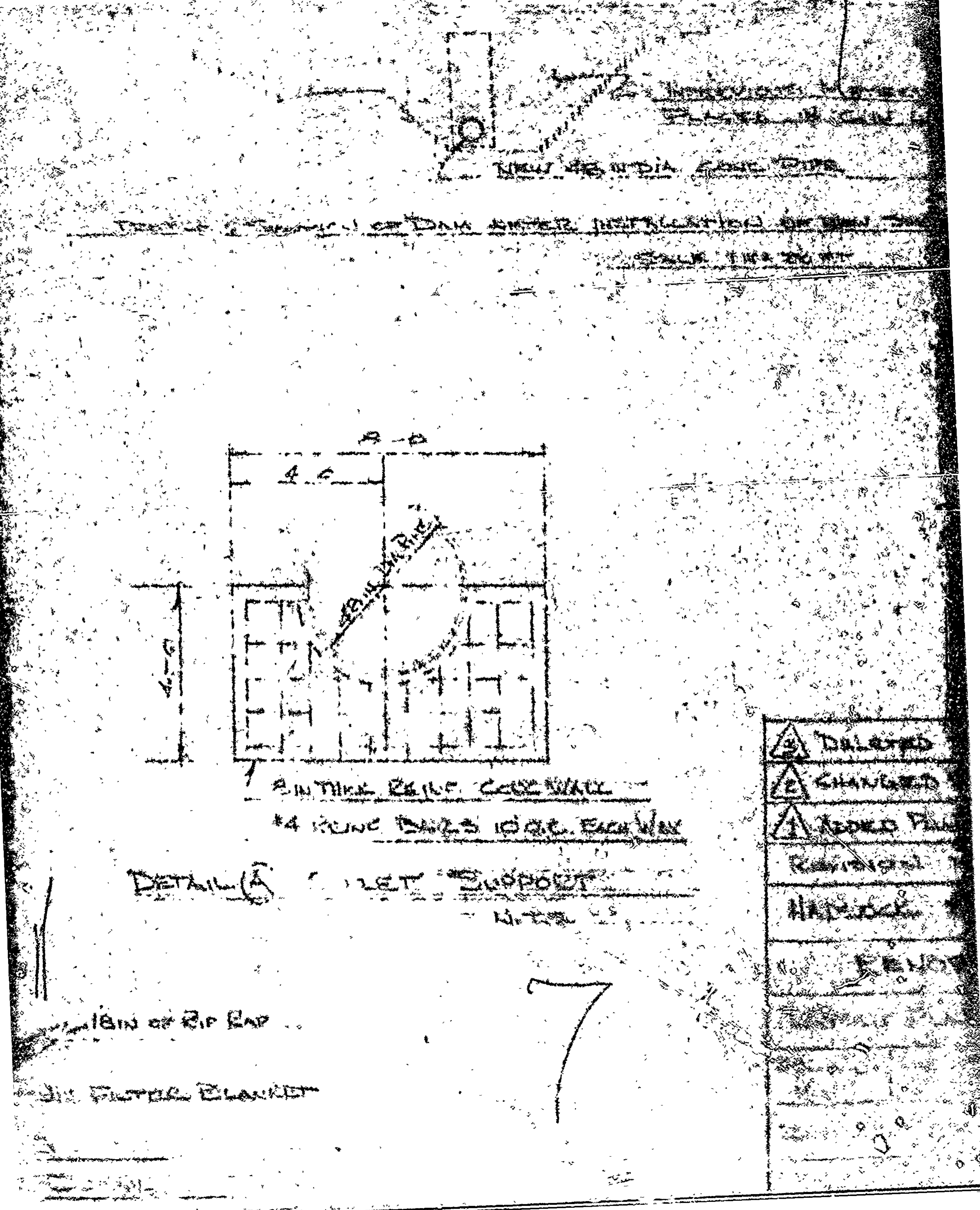


EXISTING DAM AT BREACH
SCALE 1 IN = 20 FT

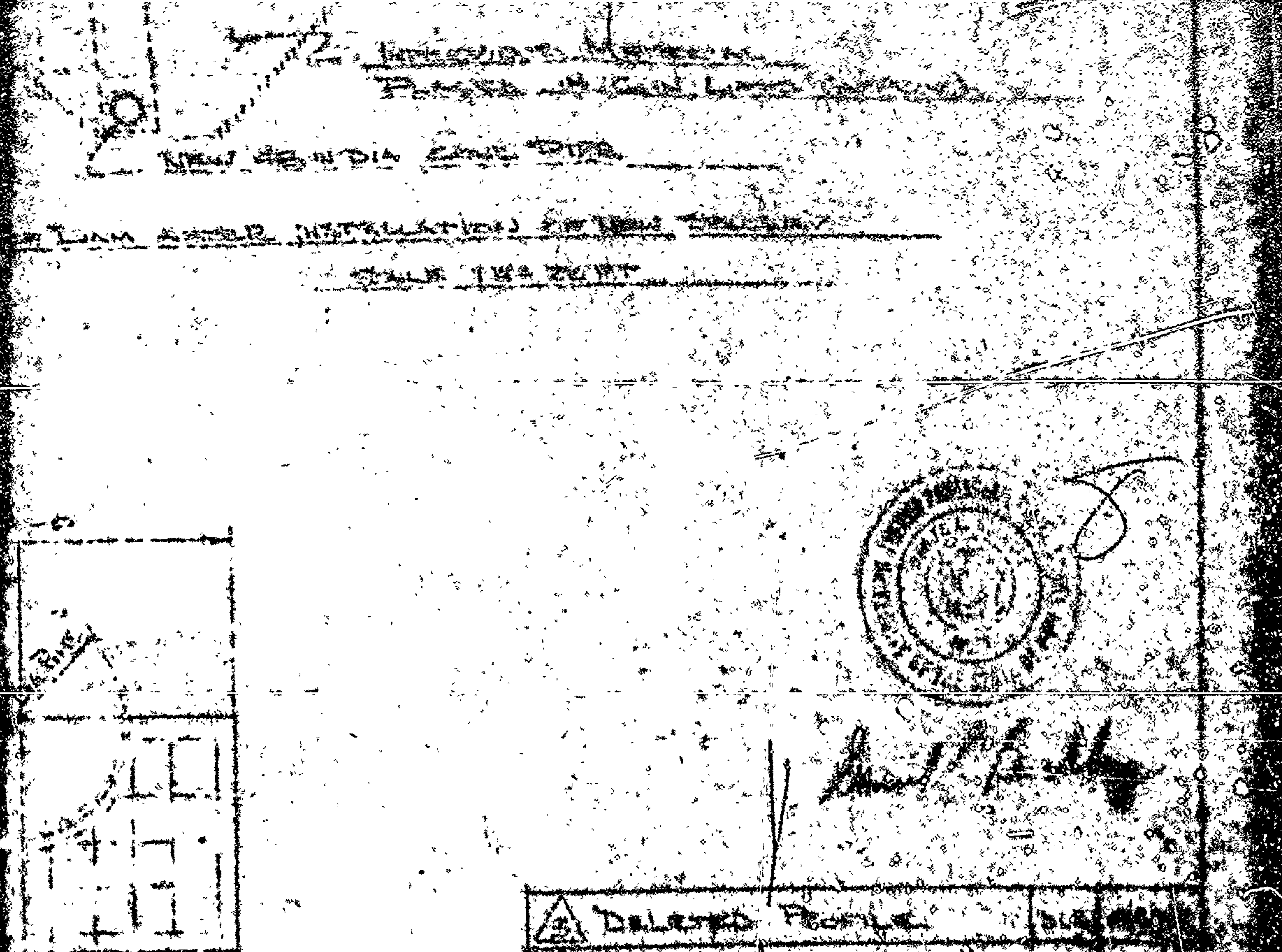
1. [illegible]
[illegible]


PLAN


SPILLWAY
INVERT ELEV 74.3
5'-0"
15'-0"
SPILLWAY
6



NEW 48 in DIA. CONC PIPE
8'-0
4'-6
8 in THK. REINF. CONC WALL
#4 REINF BARS 10 O.C. EACH WAY
DETAIL (A)
SUPPORT
18 in OF RIP RAP
FILTER BLANKET
DELETED
CHANGED
ADDED
7



REINF. CORE WALL

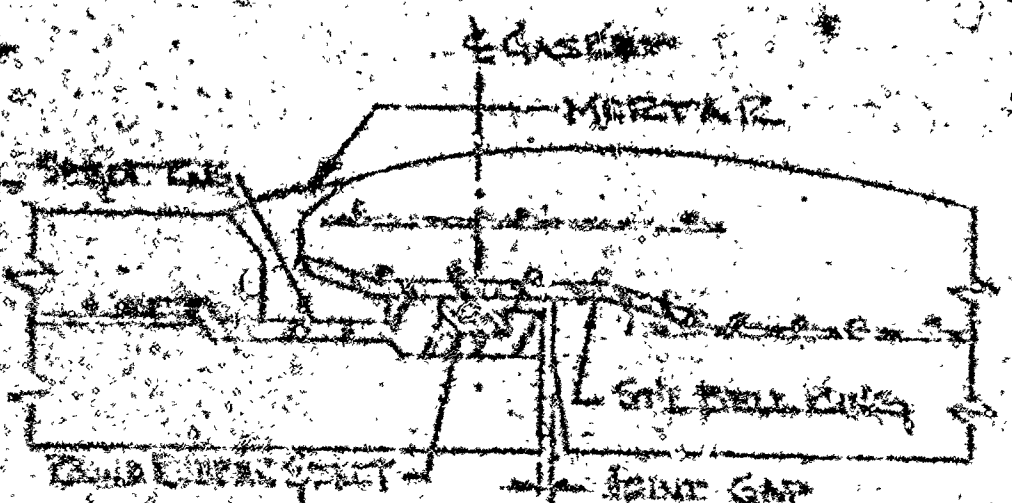
BARS C.C. EACH WAY

...T SUPPORT

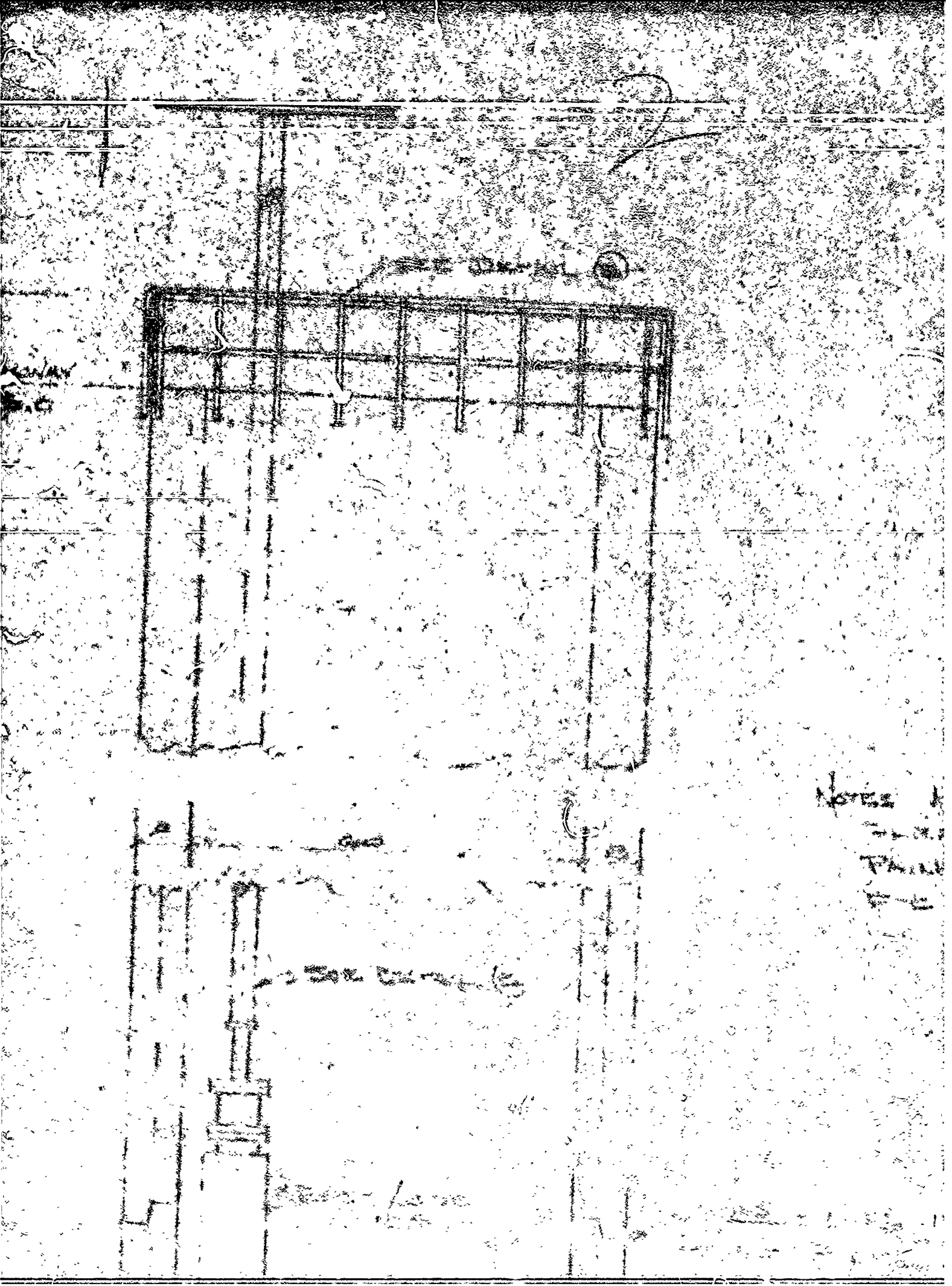
N.T.S.

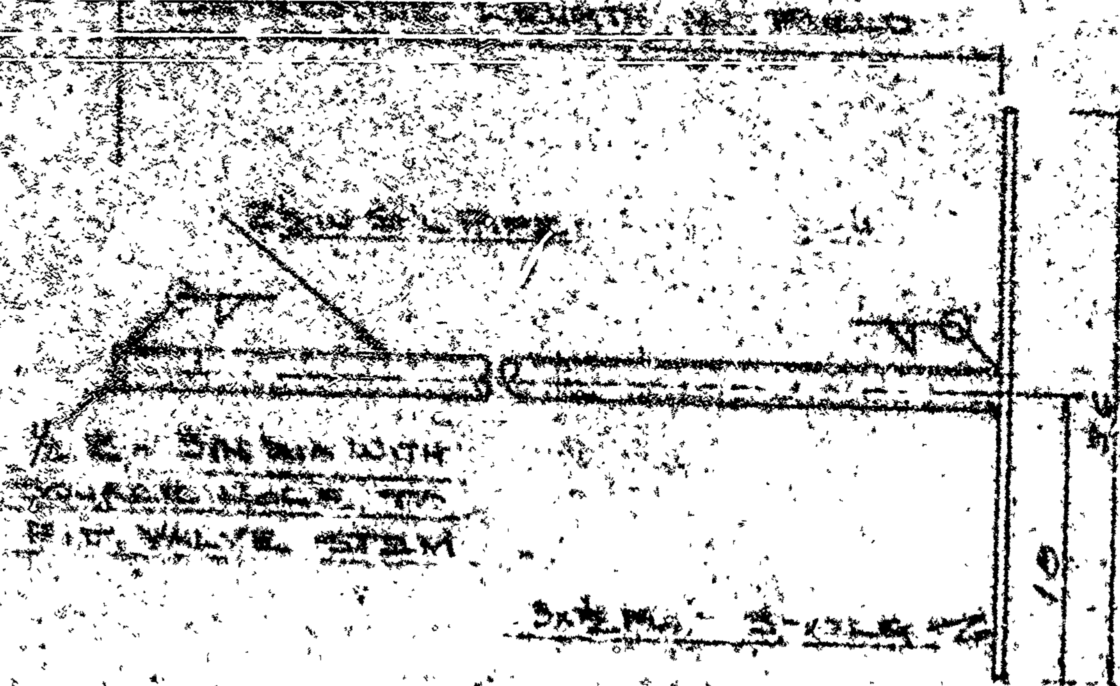
7

3 DELETED PROFILE		
2 CHANGED SLOPE		
1 ADDED PLUNGE POOL DETAIL		
REVISION		
HADLOCK POND DAM		
RENOVATIONS		
LAYOUT PLAN AND SECTIONS		



PIPE JOINT DETAIL



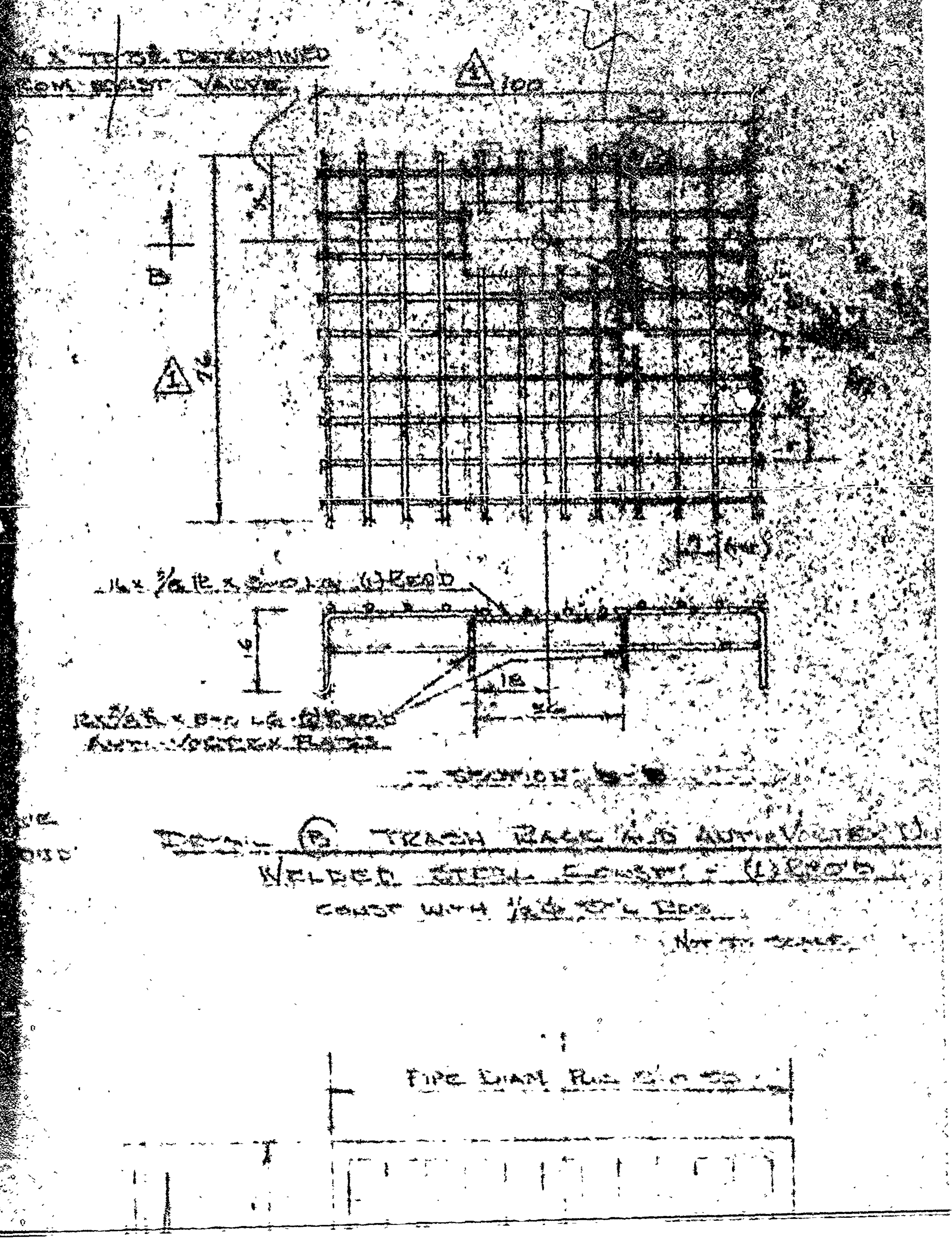


DETAIL (E) — VALVE HANDLE

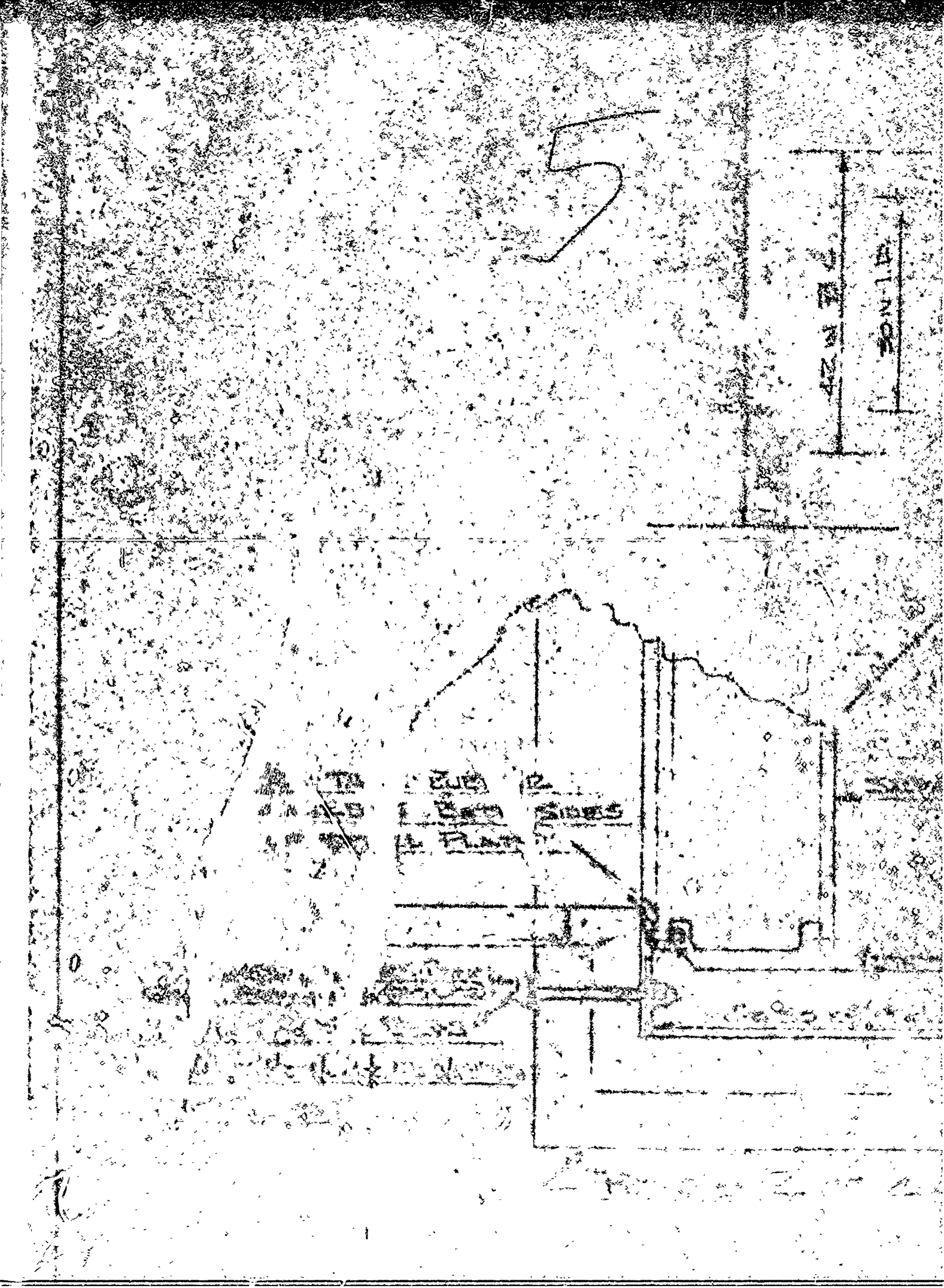
WELDED STL CONST. (1) REQ'D

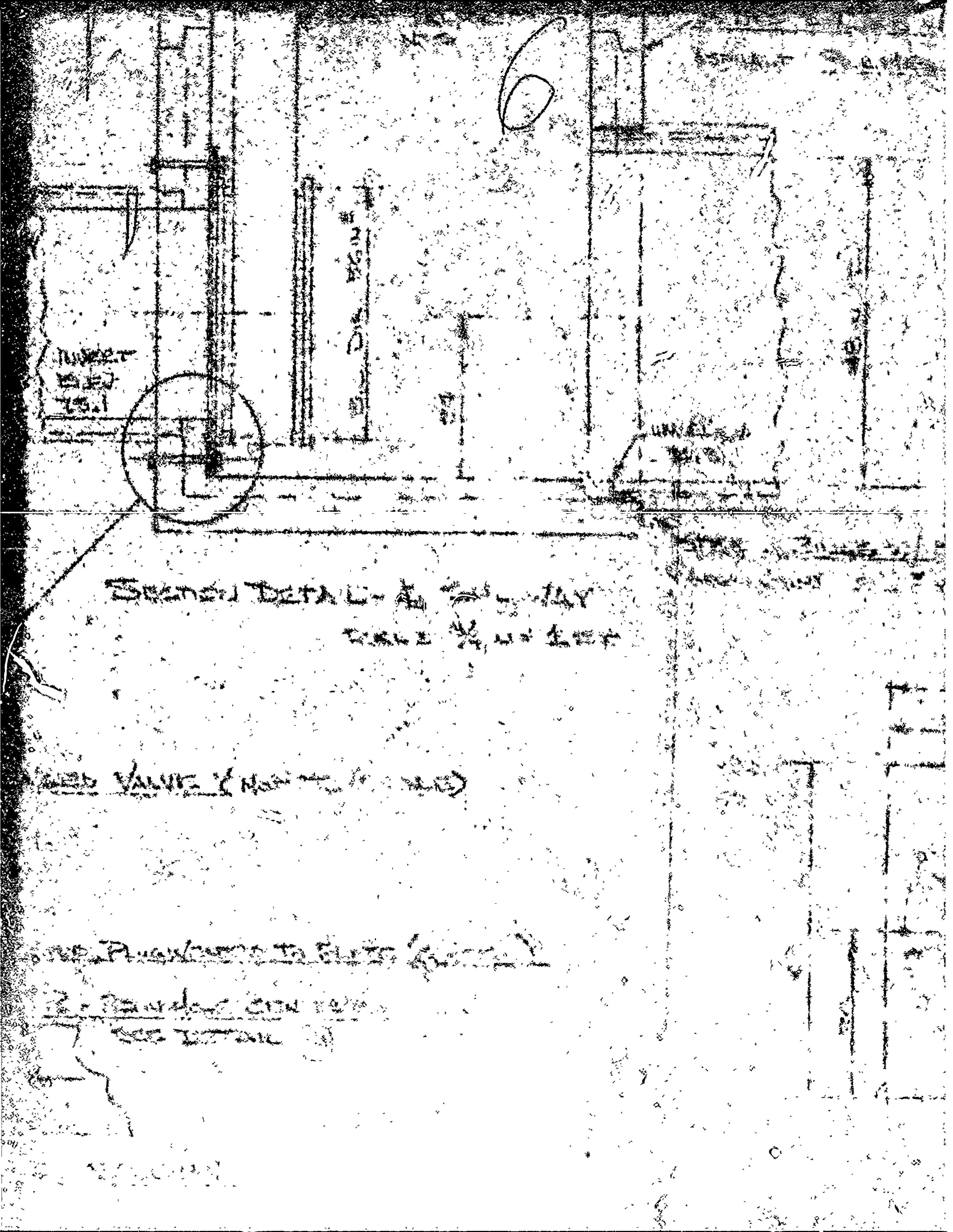
NOT TO SCALE

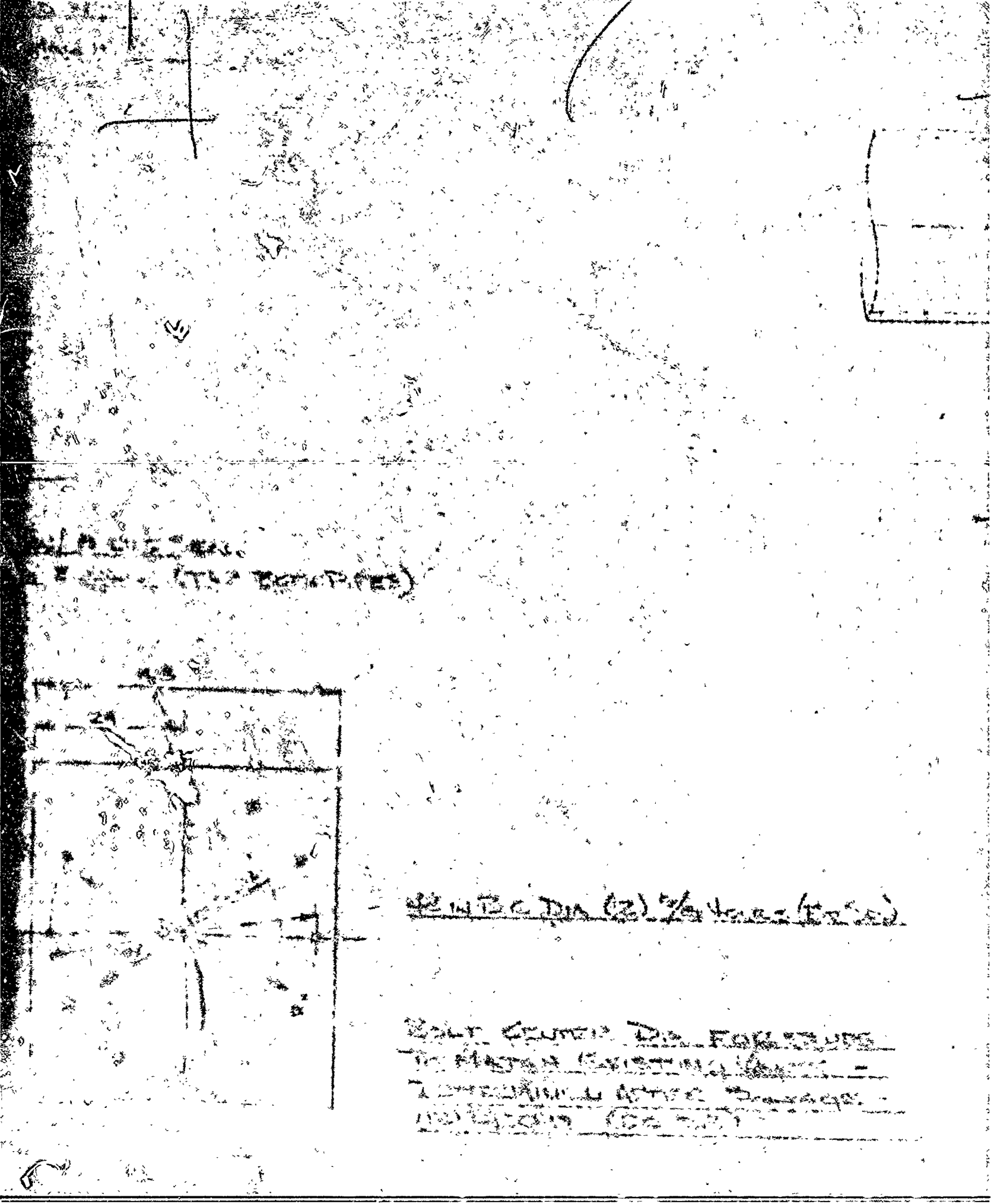
ALL FABRICATED STL ITEMS SHALL BE THOROUGHLY CLEANED AND PAINTED ONE COAT OF A RED LEAD PROTECTIVE PAINT AND A FINISH COAT OF A GREY PAINT RECOMMENDED BY THE [illegible].

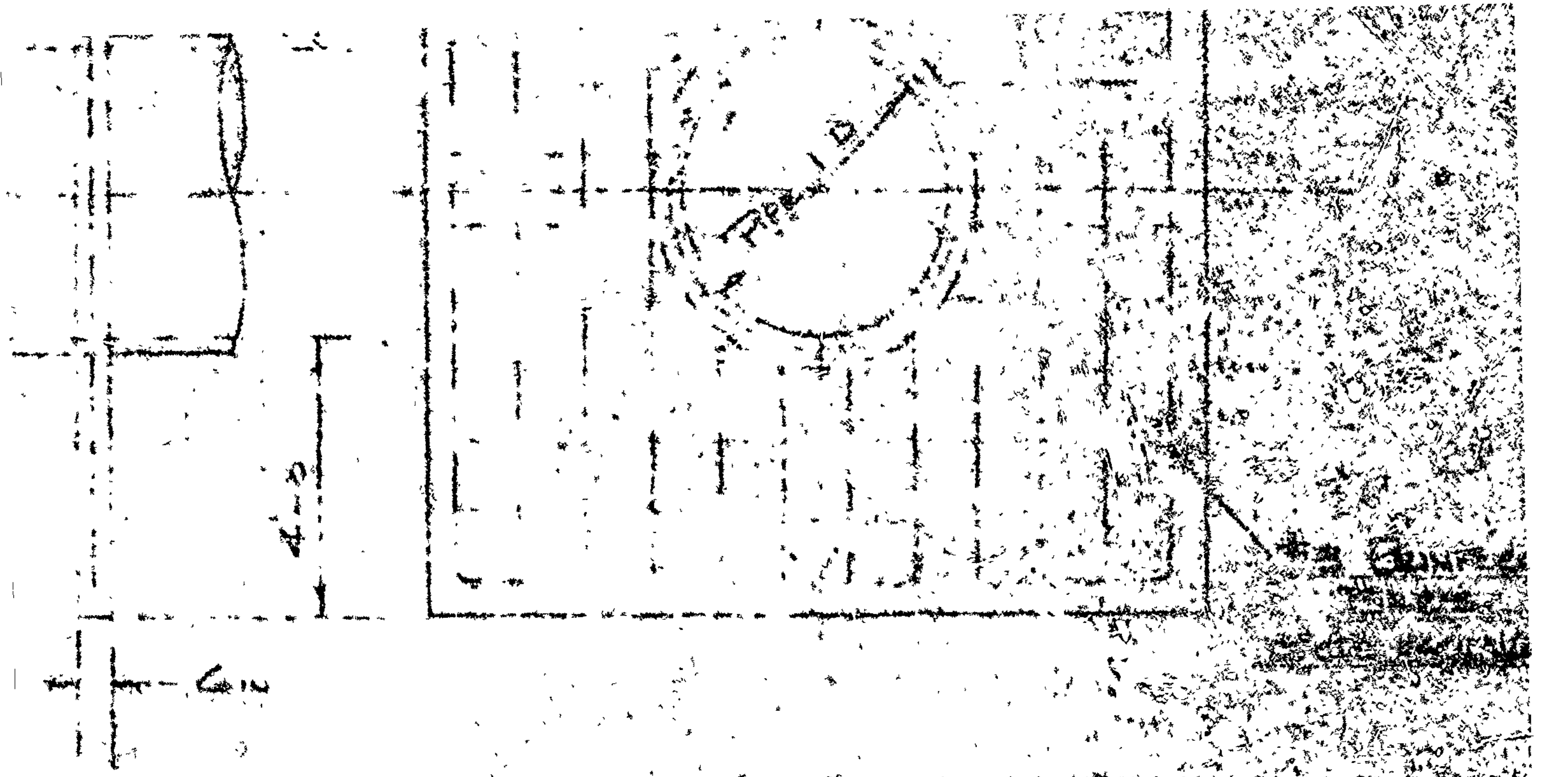


100
B
16
18
TRASH RACK




DETAIL
VALVE





SEEPAGE COLLAR (TYP) - (3) REQ'D

⚠2 ADDED PIPE JOINT D[illegible]	[illegible]	[illegible]
⚠1 DIMENSION CHANGES	[illegible]	[illegible]
REVISION		[illegible]

HADLOCK POND

[illegible]

SECTION [illegible]